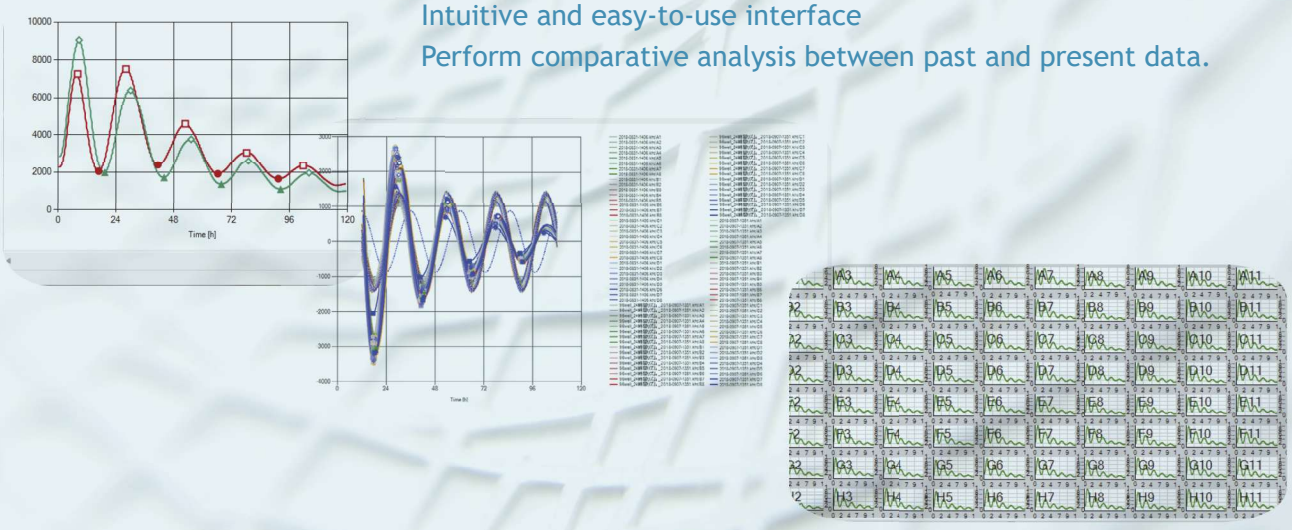
KronoAnalyzer

Time-series Analysis Software

Time-series analysis for biological clocks, temporal changes in drug responses, cell toxicity tests, etc.

Intuitive and easy-to-use interface

Perform comparative analysis between past and present data.

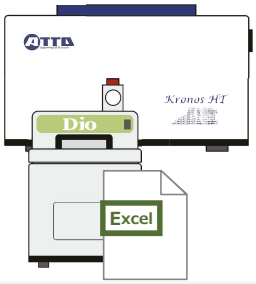


KronoAnalyzer is an analysis software suitable for analyzing various time-series data and circadian rhythms, such as biological clocks, temporal changes in drug responses, and cell toxicity tests. Circadian rhythms, which were also recently recognized with the 2017 Nobel Prize in Physiology or Medicine, regulate physiological rhythms such as sleep and hormone secretion through the periodic expression of specific genes (clock genes). ATTO's Kronos series (Kronos HT, Kronos Dio) is a system that monitors the expression of these clock genes using the luminescence of reporter genes (luciferase) over time. KronoAnalyzer is software that utilizes time-series data*1 acquired by the Kronos series to perform tasks such as extracting peak/trough times and values, calculating the period, acrophase, amplitude*2, as well as basic statistical data such as mean, standard deviation, and coefficient of variation. It is not only capable of comparing sample data within a single file but also extracting data from up to three individually acquired files for overlaying graphs and conducting comparative analyses.

*1. Time-series data: Data obtained by continuously acquiring the measurement values of the same sample.
*2. The period, peak phase, and amplitude are calculated after detrending.

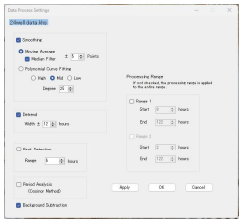
Analysis Flow

Data File



- Kronos series measurement data (kht, dtl format)
- KronoAnalyzer analysis data (krd format)
- Excel data (with template)

Data processing settings

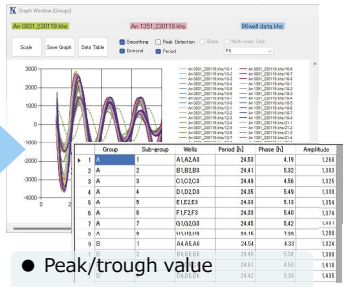


- Noise filtering
- Detrend * setting
- Peak/Trough setting
- Periodic calculation (cosiner method)
- Background subtraction
- Range of data processing

Group setting

- Layout
- Sample name
- Number of specimens (n)
- Group
- Subgroup
- Blank well

Analysis result



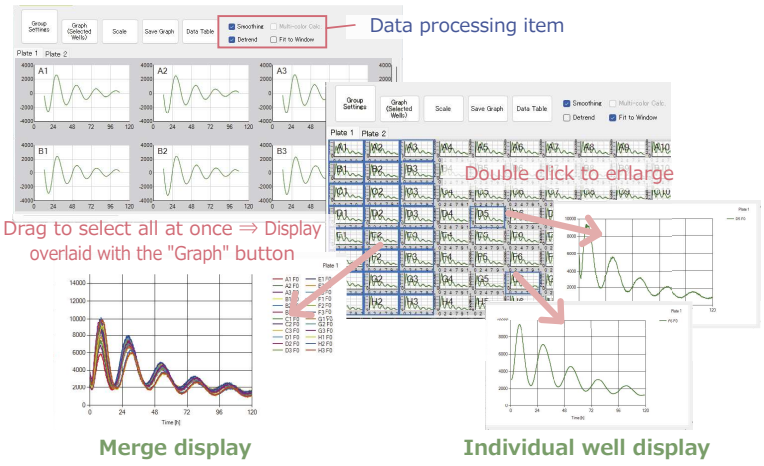
- Peak/trough value
- Period
- Amplitude
- Vertex phase (Acrophase)
- Basic statistical data (Average value, standard deviation, coefficient of variation (CV value), etc.)

* Processing to extract rhythm by eliminating the influence not derived from rhythm

ATTO SupportingLifeResearch

Data analysis with intuitive and easy operation

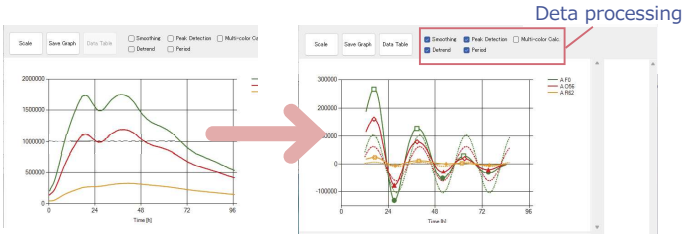
Entire display



Click the graph you want to enlarge or overlay

If you check the box of the data processing item, "Noise Filtering", "Detrend" and "Multicolor Calculation" will be reflected in all graphs. If you check "Display all", the entire 96-well plate will be displayed in a list, and if you double-click an individual well, it will be enlarged in a separate window, making it easy to compare side by side (up to 5 wells per file). After selecting multiple wells, click the "Graph" button to overlay the selected wells. Wells can be selected in a wide range by dragging the mouse pointer, and wells can be freely added and deleted with the control/shift key and click.

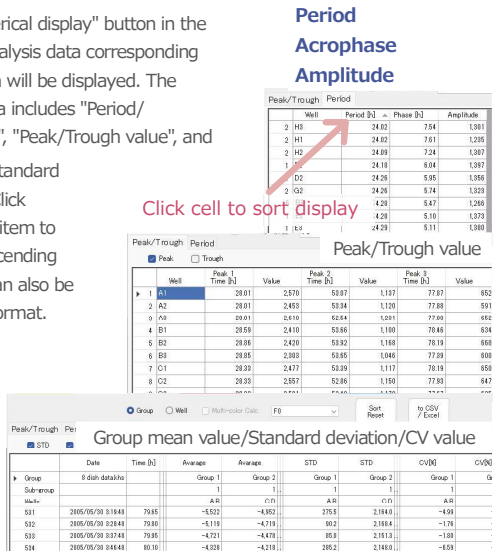
Check data processing items to reflect on the graph



There are five data processing items: "Noise filtering", "Peak/Trough", "Detrend", "Period", and "Multicolor Calculation". Checking the box will affect the graph and text data. Also, when you click a specific point on the graph, the time and value are displayed. You can easily check the analysis results while looking at the graph.

Click cell to sort display

If you click the "Numerical display" button in the graph window, the analysis data corresponding to the displayed graph will be displayed. The displayed analysis data includes "Period/ Acrophase/Amplitude", "Peak/Trough value", and "Group mean value/Standard deviation/CV value". Click inside the cell of each item to sort in ascending/descending order. Analysis data can also be output in Excel/CSV format.

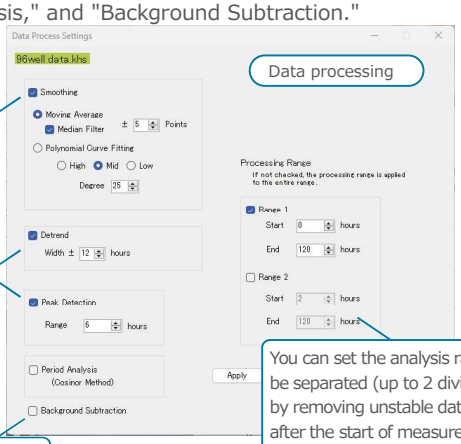


Data analysis according to desired settings

KronoAnalyzer can adjust the data processing settings according to the target organisms, phenomena, and experimental systems, enabling analysis under optimal conditions. The data processing settings include "Smoothing," "Detrend," "Peak (Trough) Detection," "Data Processing Range," "Period Analysis," and "Background Subtraction."

By combining noise filters, you can remove spike noise using a median filter and eliminate fine noise using a moving average filter.

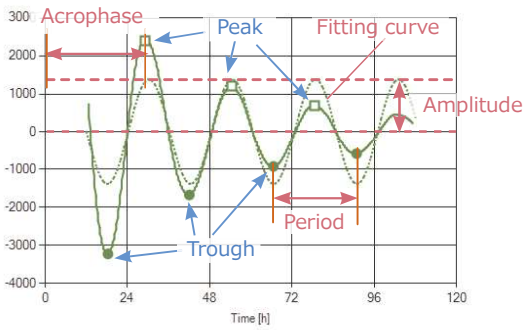
Remove the trend of the time width specified according to the experimental system. The peak/trough detection also specifies the time width in the same way.



You can set the analysis range to be separated (up to 2 divisions) by removing unstable data just after the start of measurement or by stopping the measurement temporarily due to drug administration, etc.

Background noise values specific to the measurement device can be subtracted.

Simple Analysis

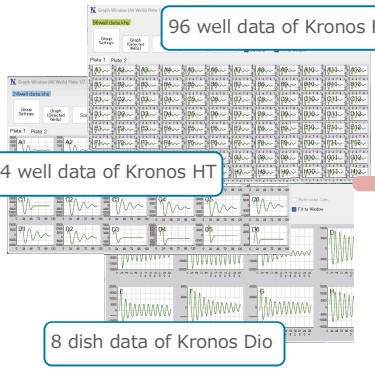


KronoAnalyzer can process various time-series data in an optimal state and allows for simultaneous comparative analysis of numerous data from multiple files. Its simple analysis results, consisting of period, acrophase, amplitude, and peak/trough values, facilitate easy comparisons.

Group settings for easy comparison and analysis of various data

KronoAnalyzer can open up to 3 files at the same time and compare and analyze the data measured in the past and the data measured by another device. By grouping and averaging samples according to measurement conditions, differences in peak/trough values, Acrophase, and Period become clear, enabling highly reproducible and highly accurate analysis. In addition, since the average value graph of each group can be displayed overlaid, it is easy to grasp the trend of the data visually.

Supports various data files

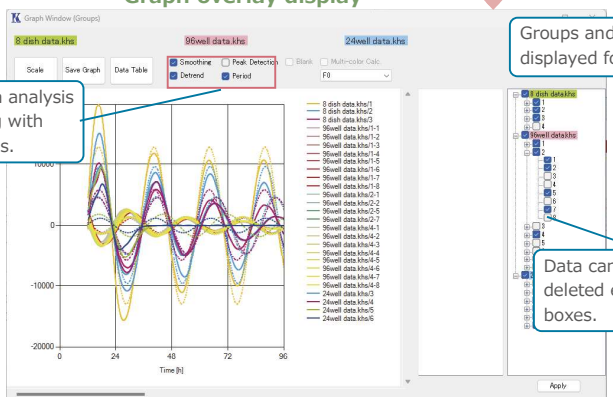


Grouping can be set from 1 well = 1 group

Each well can be categorized according to the experimental conditions by giving the number of specimens (n) < subgroup < the group an arbitrary name. The plate layout is also set semi-automatically by simply clicking on the wells. Number of specimens (n) < subgroup < 1 to 192 samples for each group (two 96-well plates) can be selected. Also, if grouped, not only Kronos series files, but also Excel files (with templates) can be overlaid and comparatively analyzed within the same file.

Even if many windows are opened, just click the desired file and it will be brought to the foreground.

Graph overlay display

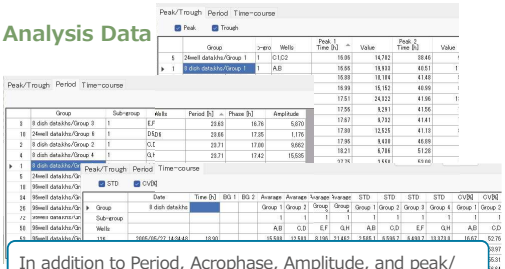


Apply data analysis processing with checkboxes.

Groups and subgroups are displayed for each file.

Data can be added or deleted easily with check boxes.

Analysis Data

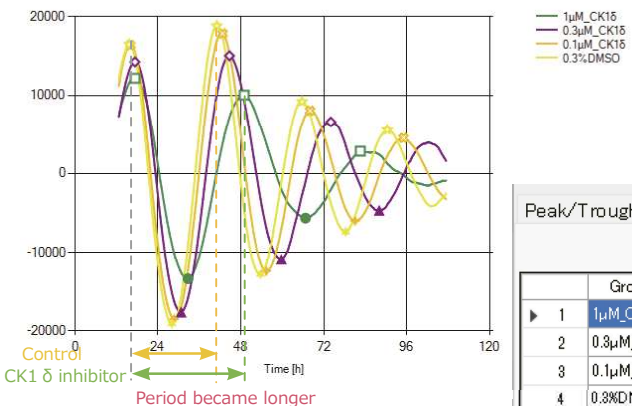


In addition to Period, Acrophase, Amplitude, and peak/trough values, the mean, standard deviation, and CV values for each group are automatically calculated. A lot of mixed data can be sorted with one click. Analysis results can also be output in Excel/CSV format.

Effects of CK1δ on circadian rhythms

Application Data

Casein kinase (CK) is said to control the circadian rhythm by phosphorylating proteins (such as PER/CRY) involved in the intracellular clock of the suprachiasmatic nucleus (SCN) in the hypothalamus. To investigate the effect of CK, Bmal1 promoter-luciferase (Bmal1-Luc) expressing MEF cells were treated with a CK1 δ inhibitor, and the expression of the reporter gene (luciferase luminescence) was monitored using Kronos Dio. BMAL1 is a transcription factor involved in the regulation of PER/CRY expression and is known to be indirectly influenced by CK. Analysis of the Kronos Dio measurement data using KronoAnalyzer revealed that as the concentration of the CK1 δ inhibitor increased, the period became longer, the acrophase was delayed, and the amplitude became smaller. Inhibition of CK1 δ suppresses the phosphorylation of PER, preventing its degradation by ubiquitin and stabilizing it. As a result, the period of PER is prolonged, and it is believed that, as a feedback from the transcription-translation of various clock genes that occur in coordination, the period of Bmal1 also increases.



[Experimental Method]
Bmal1-Luc expressing MEF cells were seeded in 35mm dishes and synchronized with dexamethasone treatment. After synchronization, they were stimulated with 0.3% DMSO or CK1 δ inhibitor (0.1-1.0 μM) containing medium for 2 hours. Subsequently, the medium was replaced with luciferin-containing medium (100 μM), and luminescence of luciferase was measured using Kronos Dio with a measurement interval of 20 minutes and a measurement time of 1 minute, with 5 replicates. The data obtained from the measurements were analyzed using KronoAnalyzer.

Peak/Trough | Period | Time-course

Period became longer

	Group	Sub-group	Wells	Period [h]	Phase [h]	Amplitude
▶ 1	1μM_CK1δ	1	A2	34.00	15.93	7,383
2	0.3μM_CK1δ	1	A3	28.66	16.46	10,382
3	0.1μM_CK1δ	1	A4	26.73	15.59	11,537
4	0.3%DMSO	1	A5	25.16	15.66	11,623

Product specifications

Specifications

Product Name ・Code	*KronoAnalyzer* ・3510155
Avairable data files	・Kronos HT/Kronos Dio/Kronos files (kht format/dtl format) ・KronoAnalyzer file (krd format) ・Excel file (with template) *Up to 3 files can be displayed, compared, and analyzed at the same time
Data display setting	**Graph display** ・Data display of all wells (up to 3 files) ・Single/parallel data display of each well (Up to 5 wells per plate, maximum 3 files x 2 plates x 5 wells selected/parallel display) ・Superimposed data display (maximum 192 groups (well) x 3 files) **Text data display** ・Time series data, Peak/Trough, Period
Data processing setting	・Noise filetering settings (Moving average/Median/Polynomial fitting) ・Detrend processing setting (Subtraction of specified moving average) ・Background value setting (Background subtraction derived from equipment) ・Blank setting (Subtraction of blank wells) ・Multicolor analysis settings (Supports multicolor emission samples) ・Peak/Trough/Period calculation setting ・Graph XY axis settings (X axis: 0 to 999 hours, Y axis: 0 to 2x109, full/auto scale, range specification) ・Data processing range setting (up to 2 sections can be set)
Group setting	・Set the number of specimens (measurements) (n=1 to n=192) ・Subgroup setting (Minimum subgroup: 1 well = 1 subgroup ~ Maximum subgroup: 192 wells = 1 subgroup ・Group setting (minimum group: 1 well = 1 group ~ maximum group: 192 wells = 1 group) ・Blank group setting (1 group)
Grouping data analysis	・Basic statistical analysis of each group: calculation of mean, standard deviation, coefficient of variation ・Data analysis for each group: time-series data, peak/trough, cycle ・Overlay display of graphs of selected groups and subgroups
Analysis Data	**Peak/Trough** ・Peak/Trough value and time ・Peak/Trough symbol display ・Data sorting (ascending/descending order) **Period calculation (cosiner method)** ・Calculation of Period /Amplitude / Acrophase (by cosiner method) ・Data sorting (ascending/descending order)
Data save format	・Save analysis data (krd) ・Save graph image (TIFF/JPEG/BMP/PNG) ・Save data processing and analysis results (Excel/CSV)
Language	Japanese/English (supports language switching on the software)
System	Windows10/11 (64bit), Memory 8GB or more Recommended display resolution 1,920×1,080

Related products

Related Products

Multi-specimen live cell real-time luminescence measurement system

WSL-1565

Kronos HT

Name	WSL-1565 Kronos HT
Detector	PMT（cooling at 10℃）×2 units
measuring container	Clear-bottom 24-well plate (standard) Clear-bottom 96-well plate, 35mm dish (optional)
No. of plates	2 plates（Independent detector for each plate）
Cultivate condition	RT +5°C to 45°C (0.1°C steps), CO^2 concentration control by CO^2 gas mixing unit (settable range: 1.0 to 20%)
Multicolor measurement	Color separation measurement (models that support 3-color separation are also available)
Size	650(W) x 520(D) x 340(H)mm, 40kg

Luminometer for 35 mm Dish with CO^2 incubator function

AB-2550

Kronos Dio

Name	AB-2550 Kronos Dio
Detector	PMT 350 ～ 670nm
No. of samples	8 samples（35 mm dish）
Cultivate condition	Temperature RT -5°C to 45°C (1°C steps)CO^2 concentration control 5% (fixed) humidification sponge for humidification
Multicolor	Separate measurement is possible for up to 3 colors
Size	280(W)×400(D)×330(H)mm ・ 16.0kg

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