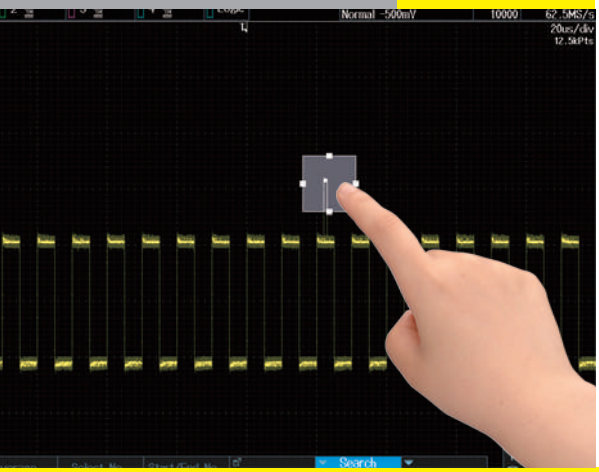
Test&Measurement

YOKOGAWA

DLM3000



# Enhanced Productivity in a Compact Instrument

## DLM3000 Series
Mixed Signal Oscilloscope

**Precision Making**

Bulletin DLM3000-01EN

## Productivity at your fingertips

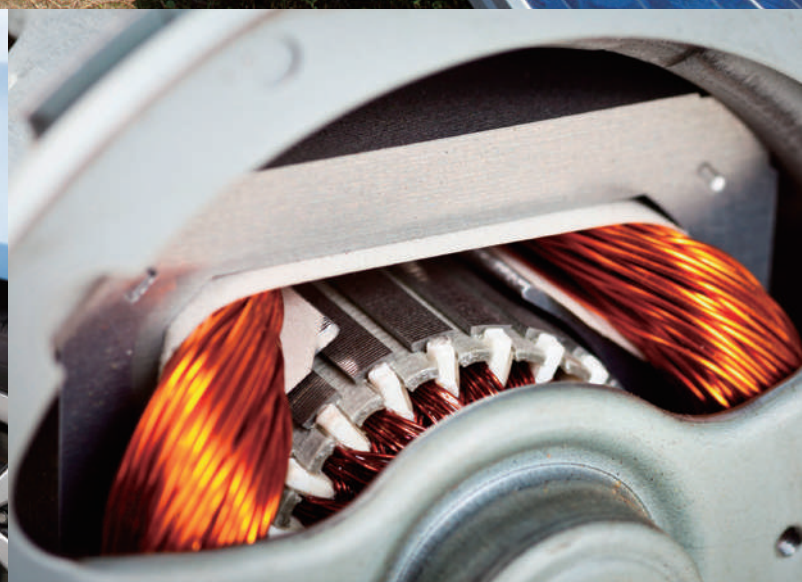
**The new DLM3000 builds on Yokogawa's oscilloscope legacy with new features focusing on quality, flexibility and usability to increase our users' productivity and meet the advanced needs of today's mechatronics designs.**
**Integrating the latest in touchscreen operation, solid-state storage, and high speed signal processing, the DLM3000 enhances productivity by providing clean signals, extensive processing, and ease of operation.**

**Quality** – Yokogawa is committed to measurement quality, and the DLM3000 features lower residual noise, extensive voltage ranges and a variety of real-time low pass filters to ensure the fidelity of your signals.

**Flexibility** – Channel count and memory depth options combined with optional Power Math and serial bus features including major automotive buses ensures an oscilloscope can be configured for a variety of needs.

**Usability** – The combination of a touchscreen with a traditional panel of oscilloscope controls allows users to seamlessly transition, while communication and storage options make it easy to access large data sets.

LOREM IPSUMDOL
LOREM IPSUMDOL
02
03



# Compact & intuitive operation

## Easy-to-Use & Easy-to-See Portrait design

### Easy to use portrait design

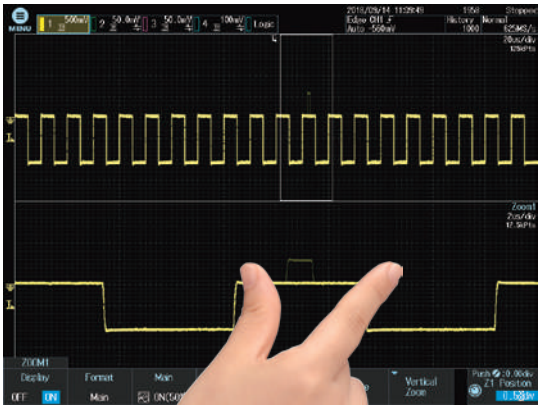
The large display of a DLM3000 is located above the controls; this enables it to be nearer the eyes of the user and keeps the footprint on the bench to a minimum.
The intuitive controls are laid out so that a user can see at a glance what channels and features are switched-on and quickly make the measurements that are needed.

### Easy to configure 8.4 inch display

Users can automatically or manually split the display to separate individual channel waveforms while maintaining their full resolution and dynamic range. It is therefore easy to see the details of all signals regardless of the number of channels in use. The portrait format saves space on the desk or test bench. The DLM3000 is “a compact personal oscilloscope” designed for easy viewing and ease of use.

### Intuitive operation with capacitive touchscreen

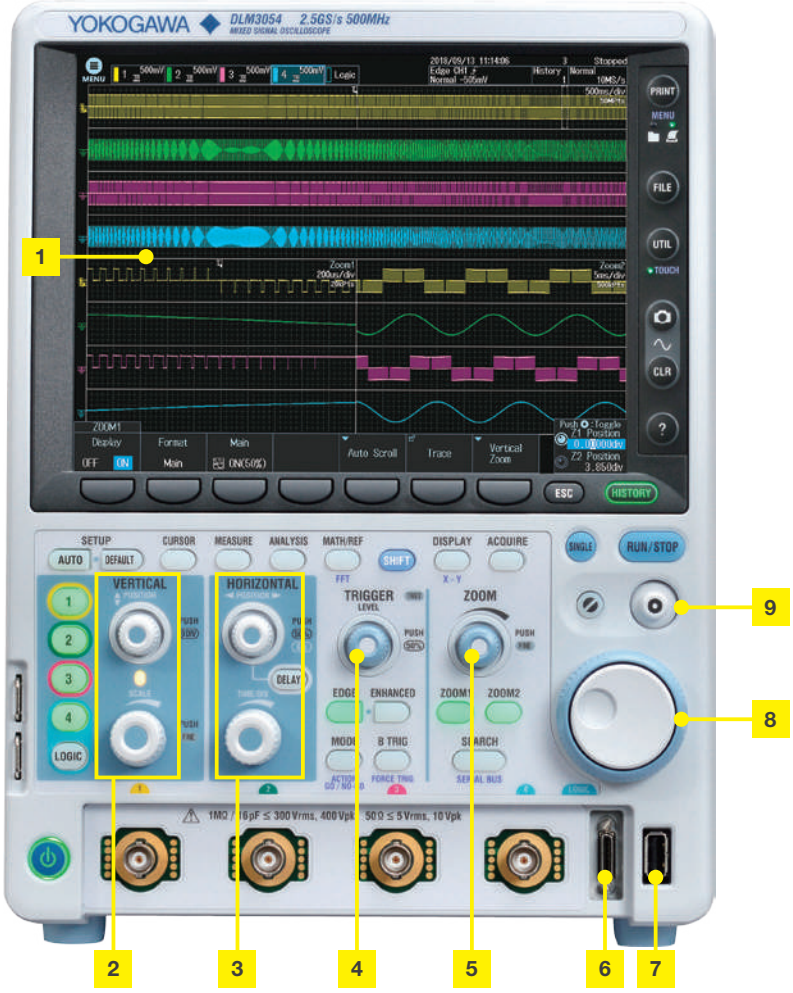
Touch system user interface provides intuitive operation. Cursor, zoom box, waveform display area, and more can be set quickly by familiar drag and pinch operations.
Conventional buttons and keys are within easy reach so users have the benefits of both control styles.



Changing zoom ratio

Selecting waveform parameter items

# DLM3000




1. 8.4-inch XGA LCD & Capacitive touchscreen
2. Vertical Position and Scale Knob
3. Horizontal Position and Scale Knob
4. Trigger Control Keys and Level Knob
5. Dedicated Zoom Keys
6. Logic input connector
7. USB peripheral connection terminal
8. Jog Shuttle and Rotary Knob
9. Four-Direction Selector Button
   Select key moves the cursor up/down/left/right

**Large screen in a compact body**

Footprint is approximately 2/3 the size of an A4 size paper (depth of approximately 200 mm)

# Best-in-class long memory

## Large capacity memory up to 500 Mpoints

Long memory is necessary to maintain high speed sample rates during long-term measurements.

**[Basic Formula] Measuring time = Memory length/Sample rate**

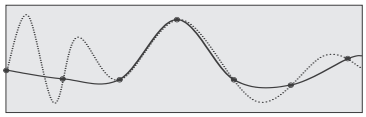
If 500 Mpoints (Memory expansion option /M2) is installed, up to 0.2 seconds waveform can be captured even at 2.5 GS/s sample rate while taking 2-ch Single Mode measurements.

**Relationship between measuring time and sample rate in 500 Mpoint**

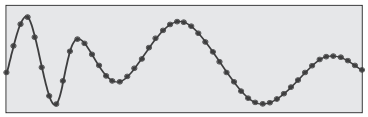
| Sample rate | Maximum measuring time |
|---|---|
| 2.5 GS/s | 0.2 s |
| 250 MS/s | 2 s |
| 25 MS/s | 20 s |
| 2.5 MS/s | 200 s |
| 250 kS/s | 2000 s |
| 100 kS/s | 5000 s |

More memory is needed to use higher sample rates and capture the most accurate waveform representation.

Sample rate is too low.



Sample rate is fairly high.



**Waveform of 500 Mpoints can be magnified up to × 200000000.**

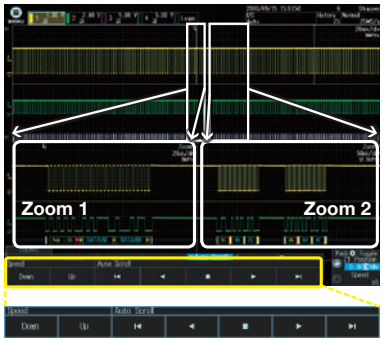
Detailed waveform measured for 20 seconds are shown in 20 milliseconds and 100 microseconds span.

## Zoom & search function

Find the most important data rapidly using two independent zoom locations and a variety of search functions.

### Zoom two locations simultaneously

Because the two zoom locations can be set individually, you can display two events side-by-side, ideal for finding cause-and-effect relationships. Also, Use Auto Scroll to sweep the zoom window across the waveforms automatically. With Auto Scroll you can choose forward, backward, fast-forward, scroll speed, and other control options.

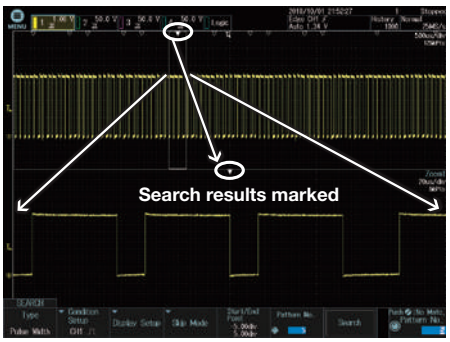



Auto Scroll menu

### Zoom Search function

Use several search criteria to automatically find and zoom into features in the waveform for further inspection. The locations of the found waveforms are marked on screen (▼shows the current location).

- **Waveform search criteria**
  Edge, pattern, pulse width, time out, serial bus (only on models with the serial bus analysis option)



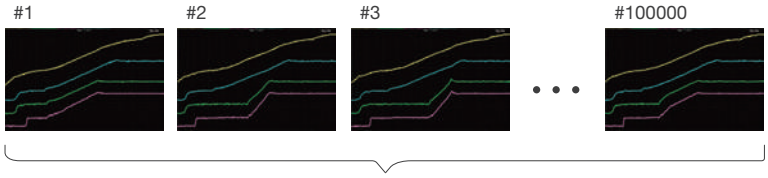

Waveform search using edge criterion

# Original History function

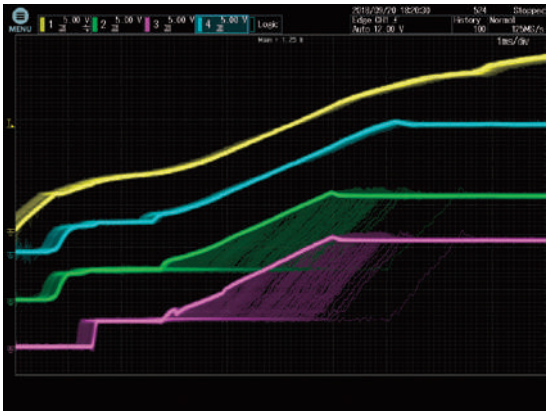
## Automatically save previously captured waveforms

**You can replay waveforms later on, so you'll never miss an abnormal waveform**

With the DLM3000 series, up to 100000 previously captured waveforms can be saved in the acquisition memory. With the History function, you can display just one or all of the previously captured waveforms (history waveforms) on screen.
You can also perform cursor measurement, computation, and other operations on history waveforms. Using the History function, you can analyze rarely-occurring abnormal signals even when an appropriate trigger condition is hard to find because its waveform shapes are not constant.




View individual captures to identify the relationship between channels at a specified moment in time.



All waveform display mode

Extract abnormal waveform

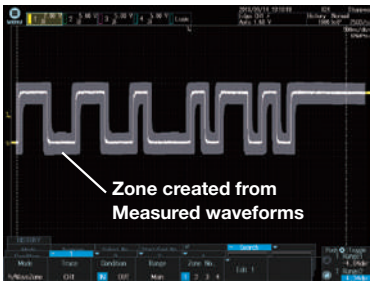
One waveform display mode

## History search function

Various search methods are available to search up to 100,000 waveforms for events meeting your custom requirements.

**Example of specified waveform search**

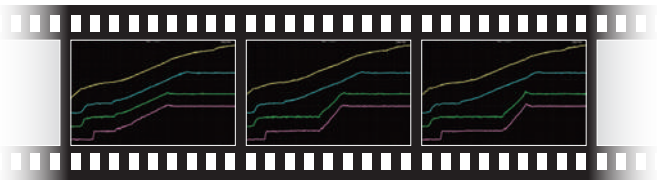
Searching for waveforms that pass through or do not pass through a rectangular zone placed on screen.




Searching for waveforms in zones created by moving measured waveforms up/down/left/right.

## Replay function

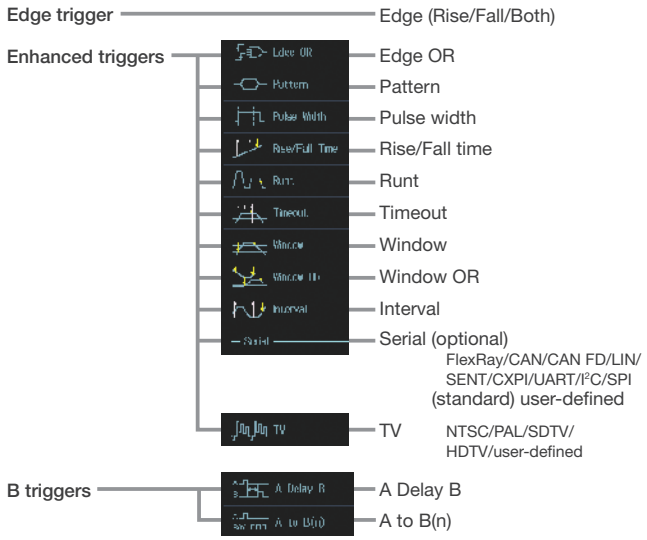
You can automatically play back, pause, fast forward, and rewind waveform history record.



# Large selection of triggers and filters

## Trigger function captures combined analog/digital complex waveforms

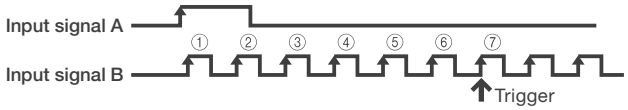
The DLM3000 series comes with a variety of easy-to-configure triggers combining analog and logic inputs such as edge, enhanced, and B triggers. By using a digital trigger system, trigger errors are minimized.




### Trigger function examples

**A to B(n) trigger**

Example: Trigger on the 7th edge of signal on B. This is effective for measurements with shifted timing, such as non-standard video signal vertical/horizontal periods or motor reference position pulses and drive pulses.




**Serial pattern trigger (user defined)**

Example: Trigger on an arbitrarily set pattern of up to 128 bits. This is effective for detecting ID/Data and other portions of proprietary communication formats.

Pattern configuration screen

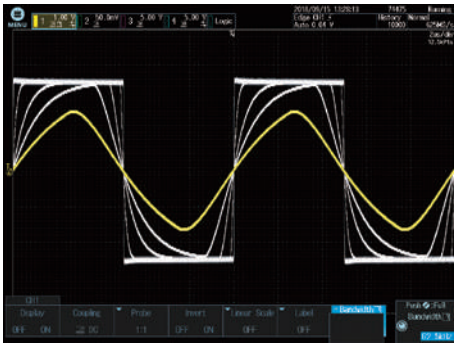
## Real time filter with optimum noise reduction supports a wide range of frequencies (from 8 kHz to 200 MHz)

The DLM3000 series has two types of filters: one processed at the input circuit and one based on MATH functions. These filters are effective for rejecting unwanted signals, allowing observation of only the desired bandwidths.

### Real time filters

Each channel has 14 low pass filters available from 8 kHz to 200 MHz. Waveforms are filtered previous to storage in memory.

Cutoff frequencies: 200 MHz, 100 MHz, 20 MHz, 10 MHz, 5 MHz, 2 MHz, 1 MHz, 500 kHz, 250 kHz, 125 kHz, 62.5 kHz, 32 kHz, 16 kHz, and 8 kHz

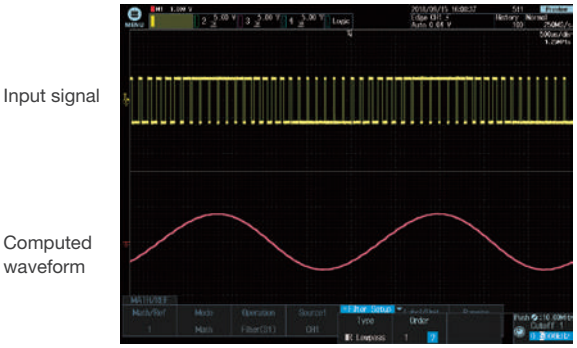


Processing with built-in filters

### Computed digital filters

The input waveform can be filtered using an IIR filter, which is a MATH function. Filtered waveforms can be displayed at the same time as the input waveform for comparison. You can select low pass or high pass filters.

Cutoff frequency setting range: 0.01 Hz to 500 MHz




Filtering of a PWM waveform using computation

# Features designed for productivity

## Displays trends of peak-to-peak or pulse width per cycle

### Measure function and statistics

Twenty-nine waveform parameter measurements are included. Automated measurement of up to 30 simultaneous measurements is available. Statistical values can also be measured continuously, cycle-by-cycle or using history memory.
In addition, cycle-by-cycle parameter measurement is possible to calculate fluctuations of a captured waveform.

### Trend and histogram displays

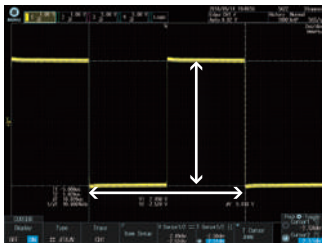
Waveform parameters such as period, pulse width, and amplitude can be measured repeatedly and displayed in graphs. In a single screen you can observe period-by-period fluctuations, compute amplitudes every screen using multiple waveforms, and display amplitudes as trends. You can also display histograms referencing the voltage or time axis using values from repeated automated measurement of waveform parameters.

Trend display of waveform parameters
Histogram display using the time axis

## Measures voltage/time differences automatically

### Cursor Measurement

Cursors can be placed on the displayed waveform from signal data, and various measurement values at the intersection of the cursor and waveform can be displayed.
There are five types of cursor; ΔT, ΔV, ΔT& ΔV, Marker, Degree Cursor.

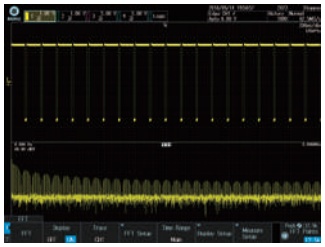


Simultaneous level and time difference measurement with the ΔT & ΔV cursor

## Analyzes frequency spectra

### FFT analysis

Up to 2 FFT analyses can be performed simultaneously. FFT can be performed on computed waveforms in addition to the actual waveforms on CH1 to CH4. Analysis can be useful for filtering, rotating machinery and other phenomena.



FFT analysis

## Keeps waveforms with one push

### Snapshot

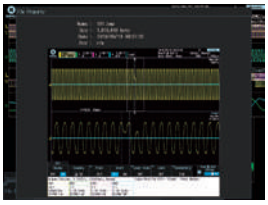
By pressing the "📷" key to the lower right of the screen, you can freeze a white trace of the currently displayed waveform on the screen. You can press the key repeatedly and conveniently leave traces for comparing multiple waveforms.
Also, snapshot data recorded on screen can be saved or loaded as files, and can be recalled for use as reference waveforms when making comparisons.

Using snapshots (white waveforms)

## Displays stored files in thumbnail format

### Thumbnails of saved files

Display thumbnails of saved waveforms, waveform images, and Wave Zone files for easier browsing, copying or deleting. A full-size view shows even more details.



Thumbnail can be viewed full-size

Thumbnails of saved files

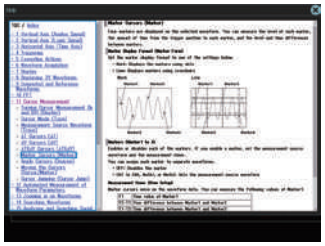
## Has a GO/NO-GO function

### Action on trigger

GO/NO-GO automates pass or fail determination for trigger conditions, waveforms, measured parameters, and other criteria. Actions automate buzzer sounds, file saving, or email notification. Waveforms in which an abnormality occurred can be saved for confirmation and analysis of the phenomena at a later time.

## Can check functions with graphical online help

Get help without having to find the user manual. Pressing the "?" key opens detailed graphical explanations of the oscilloscope's functions.



# Application-specific analysis options

## Serial analysis function options (/F01 to /F05)

### UART (RS232)/I²C/SPI/CAN/CAN FD/LIN/FlexRay/SENT/CXPI

Serial bus communication is ubiquitous in all kinds of applications including automotive applications. These buses are adopted everywhere from brake systems to car navigation systems. Communication between electronics control units (ECU's), sensors and actuators is especially important to ensure proper vehicle performance.
In addition to verifying the digital logic of the protocol, developing and verifying these systems also requires analog physical-layer verification of waveform quality, noise, and simultaneous measurement of sensors and actuator signals. The DLM3000 with the serial bus decode functions can display decoded bus data and physical layer waveforms simultaneously, perfect for validation and troubleshooting.

### Unique auto setup

Serial bus analysis typically requires numerous settings such as bit rate, voltage threshold, logic polarity, sampling point and trigger condition. These complicated settings can make it difficult to capture data and require long setup phases.
Yokogawa's proprietary auto setup function automatically analyzes the input signal and complex parameters such as bit rate and threshold level, selecting the optimal settings in seconds. This feature not only saves time but is also a powerful debugging feature when the bit rate and other parameters are unknown.

### Simultaneous analysis of up to 4 buses

Perform high-speed simultaneous analysis on up to four different serial buses operating at different speeds. Extensive search capabilities enhance the usability, allowing the user to find specific data in the very long memory. The dual-zoom facility means that different buses can be viewed and debugged alongside each other.

Serial bus auto setup

Four bus decode and list display

## User defined math option (/G02)
## Power supply analysis option (/G03)

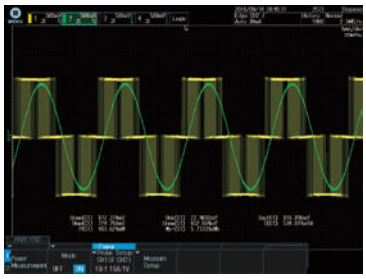
Create arbitrary calculations using a suite of operations such as arithmetic, trigonometric, pulse width and more. Dedicated power supply analysis options are available for switching loss, $I^2t$, SOA analysis, harmonic analysis of power supply, and other power parameter measurement (4 ch models only) .

### Switching loss analysis

Calculate switching loss [V(t) × i(t)] over long test cycles utilizing the long built-in memory. A wide variety of switching loss analyses are supported, including turn-on/off loss calculation, loss including continuity loss, and loss over long cycles of 50 Hz/60 Hz power line.

### Power parameter measurement

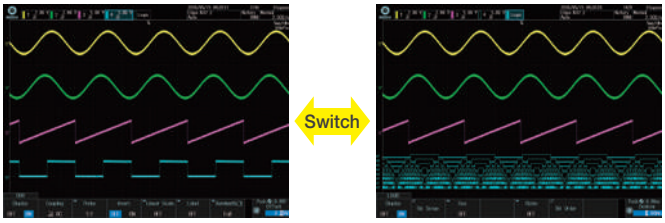
Measure power parameters automatically for up to two pairs of voltage and current waveforms, such as active power, apparent power, power factor, and more. Cycle statistics and history statistics can also be calculated.



# Analog/logic simultaneous measurement

## Flexible MSO input

Four channels is not sufficient to view the functioning of digital control circuits. The DLM3000 series converts 4 ch of analog input to 8-bit logic, and functions as a 3 ch analog + 8-bit logic MSO (mixed signal oscilloscope).

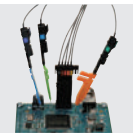



4 ch analog 3 ch analog + 8-bit logic

## The performance of up to 11 inputs by converting to logic

Using logic input, up to 11 input signals can be observed simultaneously as 3 ch of analog and 8-bit logic. It is not only possible to use logic input for observation of data and control signals, or as a trigger source, but also for logic input analysis of $I^2C$, SPI and some other serial busses.

Logic probe for the DLM3000



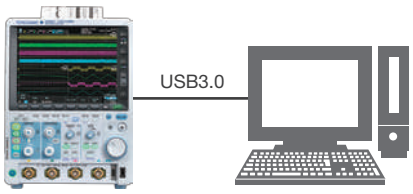
Example of logic probe connection

# Wide range of interfaces and software

## Increase work efficiency by using PC

The totally new CPU platform of the DLM3000 is equipped with Gigabit Ethernet and USB 3.0*1 as standard communication interfaces, handling data faster than ever.

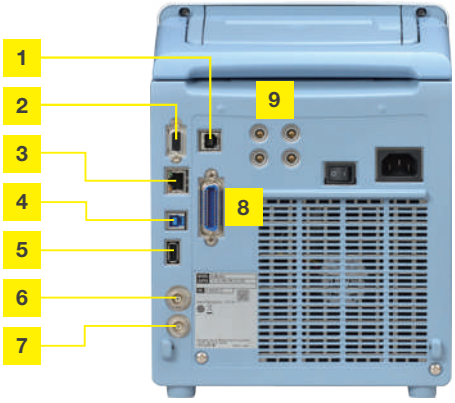
For example, DLM3000 is 10 times faster at saving to internal storage and about 10 times faster when transferring to a PC.*2 Get answers faster, even with large data sets.

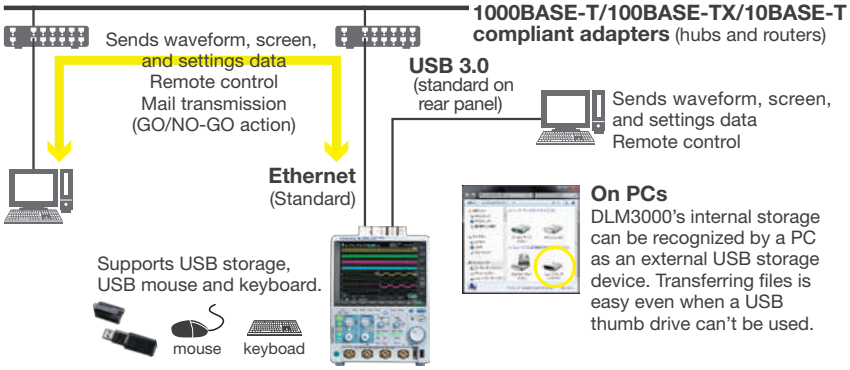



*1 USB function only. USB host function uses USB2.0 communication.

*2 When /C8 option (SSD) is installed for internal storage and USB3.0 mass storage connection is used for transfer. Compare with the conventional model (DLM2000).

## Broad Connectivity and Easier Control




| | | | | | |
|---|---|---|---|---|---|
| 1 | GO/NO-GO output terminal (optional) | 4 | USB-PC connection terminal | 7 | Trigger output |
| 2 | RGB video signal output terminal | 5 | USB peripheral connection terminal | 8 | GP-IB connection terminal (optional) |
| 3 | Ethernet | 6 | External trigger input | 9 | Probe power terminal (optional) |

## Software Control

| | Free Software | Optional Software (Trial version available) |
|---|---|---|
| Off-line waveform display and analysis | **XviewerLITE –Basic viewing–**<br>Zoom, V-cursor, conversion to CSV format | **Xviewer –Advanced Analysis–**<br>Advanced and useful functions are supported. Good for precise, off-line waveform analysis.<br>• Waveform observation and analysis<br>• Cursor, Parametric Measure<br>• Statistical Analysis<br>• Multiple file display<br>• Advanced waveform operations<br>• Comment, marking, printing and making report<br>• Optional Math computation feature<br>• Remote monitor<br>• Instruments communication function<br>• Transferring waveform & image files |
| Waveform monitoring on a PC | **XWirepuller**<br>Remote monitor and operation<br>Transferring image files | |
| Data transfer to a PC | | |
| Command control Custom software development | **Control library "TMCTL"** For Visual Studio<br>**DL-Term** Interactive tool<br>**LabVIEW instrument driver***1 *3<br>**MATLAB***2 *3 **WDF Access ToolBox**<br>Transfer data file to MATLAB | |

*1: Program development environment provided by National Instruments (NI)
*2: MathWorks's product.
*3: DLM3000 will be supported soon.

# Specifications

## Models

| Model name | Frequency bandwidth | Input terminal | Max. sample rate |
|---|---|---|---|
| DLM3022 | 200 MHz | 2 analog channels | 2.5 GS/s |
| DLM3032 | 350 MHz | | |
| DLM3052 | 500 MHz | | |
| DLM3024 | 200 MHz | 4 analog channels / 3 analog channels + 8 bit logic | |
| DLM3034 | 350 MHz | | |
| DLM3054 | 500 MHz | | |

## Analog Signal input

| | | | |
|---|---|---|---|
| Input channels<br>Analog input | DLM30x2: CH1, CH2<br>DLM30x4: CH1 to CH4 (CH1 to CH3 when using logic input) | | |
| Input coupling setting | AC 1 MΩ, DC 1 MΩ, DC 50 Ω | | |
| Input impedance<br>Analog input | 1 MΩ ±1.0%, approximately 16 pF<br>50 Ω ±1.0% (VSWR 1.4 or less, DC to 500 MHz) | | |
| Voltage axis sensitivity setting range | 1 MΩ | 500 μV/div to 10 V/div (steps of 1-2-5) | |
| | 50 Ω | 500 μV/div to 1 V/div (steps of 1-2-5) | |
| Max. input voltage | 1 MΩ | Must not exceed 300 Vrms or 400 Vpeak | |
| | 50 Ω | Must not exceed 5 Vrms or 10 Vpeak | |
| Max. DC offset setting range | 1 MΩ | 500 μV/div to 50 mV/div | ±1 V |
| | | 100 mV/div to 500 mV/div | ±10 V |
| | | 1 V/div to 10 V/div | ±100 V |
| | 50 Ω | 500 μV/div to 50 mV/div | ±1 V |
| | | 100 mV/div to 1 mV/div | ±5 V |
| Vertical-axis (voltage-axis)<br>DC accuracy[*1] | 500 μV/div | ±(3.0% of 8 div + offset voltage accuracy) | |
| | 1 mV/div to 10 V/div | ±(1.5% of 8 div + offset voltage accuracy) | |
| Offset voltage accuracy[*1] | 500 μV to 50 mV/div | ±(1% of setting + 0.2 mV) | |
| | 100 mV to 500 mV/div | ±(1% of setting + 2 mV) | |
| | 1 V to 10 V/div | ±(1% of setting + 20 mV) | |

Frequency characteristics (–3 dB attenuation when inputting a sinewave of amplitude ±3 div)[*1*2]

| | | DLM302x | DLM303x | DLM305x |
|---|---|---|---|---|
| 1 MΩ (when using attached 10:1 passive probe) | 20 mV to 100 V/div | 200 MHz | 350 MHz | 500 MHz |
| | 10 mV/div | 200 MHz | 350 MHz | 350 MHz |
| | 5 mV/div | 200 MHz | 200 MHz | 200 MHz |
| 50 Ω | 2 mV to 10 V/div | 200 MHz | 350 MHz | 500 MHz |
| | 1 mV/div | 200 MHz | 350 MHz | 350 MHz |
| | 500 μV/div | 200 MHz | 200 MHz | 200 MHz |

| | | | |
|---|---|---|---|
| Isolation between channels | Maximum bandwidth: –34 dB (typical value) | | |
| Residual noise level[*3] | The larger of 0.2 mVrms or 0.05 div rms (typical value) | | |
| A/D resolution | 8 bit (25 LSB/div) Max. 12 bit (in High Resolution mode) | | |
| Bandwidth limit | FULL, 200 MHz, 100 MHz, 20 MHz, 10 MHz, 5 MHz, 2 MHz, 1 MHz, 500 kHz, 250 kHz, 125 kHz, 62.5 kHz, 32 kHz, 16 kHz, 8 kHz (can be set for each channel) | | |
| Maximum sample rate | Real time sampling mode | 2.5 GS/s | |
| | Repetitive sampling mode | 250 GS/s | |

Maximum record length (Points)

| | | Repeat | Single (when odd ch only) |
|---|---|---|---|
| 2 ch model | | 12.5 M | 50 M (125 M) |
| 4 ch model | | 12.5 M | 50 M (125 M) |
| | /M1 | 25 M | 125 M (250 M) |
| | /M2 | 50 M | 250 M (500 M) |

| | |
|---|---|
| Ch-to-Ch deskew | ±1 μs |
| Time axis setting range | 1 ns/div to 500 s/div (steps of 1-2-5) |
| Time base accuracy[*1] | ±0.002% |
| Dead time in N Single mode | Approx. 0.9 μs |

## Logic Signal Input (4 ch model only)

| | |
|---|---|
| Number of inputs | 8 bit (excl. 4 ch input and logic input) |
| Maximum toggle frequency[*1] | Model 701988: 100 MHz, Model 701989: 250 MHz |
| Compatible probes | 701988, 701989 (8 bit input) |
| Min. input voltage | 701988: 500 mVp-p, 701989: 300 mVp-p |
| Input range | Model 701988: ±40 V<br>Model 701989: threshold ±6 V |
| Max. nondestructive input voltage | Model 701988: ±42 V (DC + ACpeak) or 29 Vrms<br>Model 701989: ±40 V (DC + ACpeak) or 28 Vrms |
| Threshold level setting range | Model 701988: ±40 V (setting resolution of 0.05 V)<br>Model 701989: ±6 V (setting resolution of 0.05 V) |
| Input impedance | 701988: Approx. 1 MΩ/approx. 10 pF,<br>701989: Approx. 100 kΩ/approx. 3 pF |
| Maximum sampling rate | 1.25 GS/s |

Maximum record length (Points)

| | Repeat | Single |
|---|---|---|
| Standard | 12.5 M | 50 M |
| /M1 | 25 M | 125 M |
| /M2 | 50 M | 250 M |

## Triggers

| | | | |
|---|---|---|---|
| Trigger modes | Auto, Auto Level, Normal, Single, N-Single, Force trigger | | |
| Trigger type, trigger source<br>A triggers | Edge | CH1 to CH4, Logic, EXT, LINE | |
| | Edge OR | CH1 to CH4 | |
| | Pulse Width | CH1 to CH4, Logic | |
| | Timeout | CH1 to CH4, Logic | |
| | Pattern | CH1 to CH4, Logic | |
| | Runt | CH1 to CH4 | |
| | Rise/Fall Time | CH1 to CH4 | |
| | Interval | CH1 to CH4, Logic | |
| | Window | CH1 to CH4 | |
| | Window OR | CH1 to CH4 | |
| | TV | CH1 to CH4 | |
| | Serial Bus | I²C (optional) | CH1 to CH4, Logic |
| | | SPI (optional) | CH1 to CH4, Logic |
| | | UART (optional) | CH1 to CH4, Logic |
| | | FlexRay (optional) | CH1 to CH4 |
| | | CAN (optional) | CH1 to CH4 |
| | | CAN FD (optional) | CH1 to CH4 |
| | | LIN (optional) | CH1 to CH4 |
| | | SENT (optional) | CH1 to CH4, Logic |
| | | CXPI (optional) | CH1 to CH4 |
| | | User Define | CH1 to CH4 |
| AB triggers | A Delay B | 10 ns to 10 s | |
| | A to B(n) | 1 to $10^9$ | |
| Trigger level setting range | CH1 to CH4 | ±4 div from center of screen | |
| Trigger level setting resolution | CH1 to CH4 | 0.01 div (TV trigger: 0.1 div) | |
| Trigger level accuracy[*1] | CH1 to CH4 | ±0.04 div | |

## Display

| | |
|---|---|
| Display[*4] | 8.4-inch TFT LCD with a capacitive touch screen, 1024 × 768 (XGA) |

## Functions

| | | |
|---|---|---|
| Waveform acquisition modes | Normal, Envelope, Average | |
| High Resolution mode | Max. 12 bit | |
| Sampling modes | Real time, interpolation, repetitive | |
| Accumulation | Select OFF, Intensity (waveform frequency by brightness), or Color (waveform frequency by color)<br>Accumulation time: 100 ms to 100 s, Infinite | |
| Roll mode | Enabled at 100 ms/div to 500 s/div (depending on the record length setting) | |
| Zoom function | Two zooming windows can be set independently (Zoom1, Zoom2) | |
| | Zoom factor | ×2 to 2.5 points/10 div (in zoom area) |
| | Scroll | Auto Scroll |
| | Search functions | Edge, Pulse Width, Timeout, Pattern, I²C (optional), SPI (optional), UART (optional), CAN (optional), CAN FD (optional), LIN (optional), FlexRay (optional), SENT (optional), CXPI (optional), User Define |
| History memory | Max. data (record length 1.25 k Points, with) | /M2: 100000, /M1: 50000, Standard: 20000 |
| | History search | Select Rect, Wave, Polygon, or Parameter mode |
| | Replay function | Automatically displays the history waveforms sequentially |
| | Display | Specified or average waveforms |
| Cursor | Types | ΔT, ΔV, ΔT & ΔV, Marker, Degree |
| Snapshot | Currently displayed waveform can be retained on screen | |

## Computation and Analysis Functions

| | |
|---|---|
| Parameter Measurement | Max, Min, P-P, High, Low, Amplitude, Rms, Mean, Sdev, IntegTY+, IntegTY, +Over, –Over, Pulse Count, Edge Count, V1, V2, ΔT, Freq, Period, Avg Freq, Avg Period, Burst, Rise, Fall, +Width, –Width, Duty, Delay |
| Statistical computation of parameters | Max, Min, Mean, σ, Count |
| Statistics modes | Continuous, Cycle, History |
| Trend/Histogram display of wave parameters | Up to 2 trend or histogram display of specified wave parameters |

| | |
|---|---|
| Computations (MATH) | +, –, ×, Filter (Delay, Moving Avg, IIR Lowpass, IIR Highpass), Integ, Count (Edge, Rotary), user defined math (optional) |
| Computable no. of traces | 4 (Math1 to Math4) (2 trace for 2 ch model) (mutually exclusive with REF trace) |
| Max. computable memory length | Same as the maximum record length |
| Reference function | Up to 4 traces (REF1 to REF4) of saved waveform data can be displayed and analyzed (mutually exclusive with MATH trace) |
| Action-on-trigger | Actions: Buzzer, Print, Save, Mail |
| GO/NO-GO*5 | Modes: Rect, Wave, Polygon, Parameter<br>Actions: Buzzer, Print, Save, Mail |
| X-Y | Displays XY1, to XY2 and T-Y simultaneously |
| FFT | Number of points: 1.25 k, 2.5k, 12.5 k, 25 k, 125 k, 250 k, 1.25 M<br>Window functions: Rectangular, Hanning, Flat-Top<br>FFT Types: PS (LS, RS, PSD, CS, TF, CH are available with /G02 option) |
| Histogram | Displays a histogram of acquired waveforms |
| User-defined math*6 (/G02 option) | The following operators can be arbitrarily combined in equations: +, –, ×, /, SIN, COS, TAN, ASIN, ACOS, ATAN, INTEG, DIFF, ABS, SQRT, LOG, EXP, LN, BIN, DELAY, P2 (power of 2), PH, DA, MEAN, HLBT, PWHH, PWLL, PWHL, PWLH, PWXX, FV, DUTYH, DUTYL, FILT1, FILT2<br>The maximum record length that can be computed is the same as the standard math functions. |
| Power supply analysis (/G03 option)*6 | |
| Power analysis | Selectable from 4 analysis types<br>Deskweing between the voltage and current waveforms can be executed automatically. |
| Switching loss | Measurement of total loss and switching loss, power waveform display, Automatic measurement and statistical analysis of power analysis items (PTurn On, PTurn Off, POn, PTotal, WpTurn On, WpTurn Off, Wp On, WpTotal, Cycle Count) |
| Safety operation area | SOA analysis by X-Y display, using voltage as X axis, and current as Y axis is possible |
| Harmonic analysis | Basic comparison is possible with following standard<br>Harmonic emission standard IEC61000-3-2 edition 4.0, EN61000-3-2 (2006), IEC61000-4-7 edition 2 |
| Joule integral | Joule integral ($I^2t$) waveform display, automatic measurement and statistical analysis is possible |
| Power Measurement | Automated measurement of power parameters for up to two pairs of voltage and current waveforms. Values can be statistically processed and calculated. |
| Measurement parameters | Urms, Unm, Udc, Urmn, Uac, U+pk, U–pk, Up–p, Irms, Imn, Idc, Irmn, Iac, I+pk, I–pk, Ip–p, P, S, Q, Z, λ, Wp, Wp+, Wp–, Abs.Wp, q, q+, q–, Abs.q, Avg Freq (voltage, current) |

| **Common Features of Serial Bus Signal Analysis Functions** | |
|---|---|
| Analysis result display | Decoded information is displayed together with waveforms or in list form. |
| Auto setup function | A threshold value, time axis scale, voltage axis scale and other bus-specific parameters such as a bit rate and recessive level are automatically detected.<br>Trigger conditions are set based on the detected result and decoded information is displayed.<br>(The type of a bus signal needs to be specified in advance.) |
| Search function | Search of all waveforms for a position that matches a pattern or condition specified by data information. |
| Analysis result saving function | Analysis list data can be saved to CSV-format files. |

| **$I^2C$ Bus Signal Analysis Functions (/F01 Option)*6** | | |
|---|---|---|
| Applicable bus | $I^2C$ bus | Bus transfer rate: 3.4 Mbit/s max.<br>Address mode: 7 bit/10 bit |
| | SM bus | Complies with System Management Bus |
| Analyzable signals | CH1 to CH4, Logic input, or M1 to M4 | |
| $I^2C$ trigger modes | Every Start, Address & Data, NON ACK, General Call, Start Byte, HS Mode | |
| Analyzable no. of data | 300000 bytes max. | |
| List display items | Analysis no., time from trigger position [Time (ms)], 1st byte address, 2nd byte address, R/W, Data, Presence/absence of ACK, information | |

| **SPI Bus Signal Analysis Functions (/F01 Option)*6** | |
|---|---|
| Trigger types | 3 wire, 4 wire<br>After assertion of CS, compares data after arbitrary byte count and triggers. |
| Analyzable signals | CH1 to CH4, Logic input, M1 to M4 |
| Byte order | MSB, LSB |
| Analyzable no. of data | 300000 bytes max. |
| List display items | Analysis no., time from trigger position [Time (ms)], Data 1, Data 2 |

| **UART Signal Analysis Functions (/F01 Option)*6** | |
|---|---|
| Bit rate | 115200 bps, 57600 bps, 38400 bps, 19200 bps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, User Define (an arbitrary bit rate from 1 k to 10 Mbps with resolution of 100 bps) |
| Analyzable signals | CH1 to CH4, Logic input, or M1 to M4 |
| Data format | Select a data format from the following<br>8 bit (Non Parity), 7 bit Data + Parity, 8 bit + Parity |
| UART trigger modes | Every Data, Data, Error |
| Analyzable no. of data | 300000 bytes max. |
| List display items | Analysis no., time from trigger position [Time (ms)], Data (Bin, Hex) display, ASCII display, Information. |

| **CAN Bus Signal Analysis Functions (/F02 Option)*6** | |
|---|---|
| Applicable bus | CAN version 2.0A/B, Hi-Speed CAN (ISO11898), Low-Speed CAN (ISO11519-2) |
| Analyzable signals | CH1 to CH4, M1 to M4 |
| Bit rate | 1 Mbps, 500 kbps, 250 kbps, 125 kbps, 83.3 kbps, 33.3 kbps, User Define (an arbitrary bit rate from 10 kbps to 1 Mbps with resolution of 100 bps) |
| CAN bus trigger modes | SOF, ID/Data, ID OR, Error, Message and signal (enabled when loading physical values/symbol definitions) |
| Analyzable no. of frames | 100000 frames max. |
| List display items | Analysis no., time from trigger position [Time (ms)], Frame type, ID, DLC, Data, CRC, presence/absence of Ack, Information |
| Auxiliary analysis functions | Field jump functions |

| **CAN FD Bus Signal Analysis Functions (/F02 Option)*6** | | |
|---|---|---|
| Applicable bus | CAN FD (ISO 11898-1:2015 and non-ISO) | |
| Analyzable signals | CH1 to CH4, M1 to M4 | |
| Bit rate | Arbitration | 1 Mbps, 500 kbps, 250 kbps, User Define (an arbitrary bit rate from 20 kbps to 1 Mbps with resolution of 100 bps) |
| | Data | 8 Mbps, 5 Mbps, 4 Mbps, 2 Mbps, 1 Mbps, 500 kbps, User Define (an arbitrary bit rate from 250 kbps to 10 Mbps with resolution of 100 bps) |
| CAN FD bus trigger modes | SOF, ID, ID OR, Error Frame, Message (enabled when loading physical values/symbol definitions) | |
| Analyzable no. of frames | 50000 frames max. | |
| List display items | Analysis no., time from trigger position [Time (ms)], Frame type, ID, DLC, Data, CRC, presence/absence of Ack, Information | |
| Auxiliary analysis functions | Field jump functions | |

| **LIN Bus Signal Analysis Functions (/F02 Option)*6** | |
|---|---|
| Applicable bus | LIN Rev. 1.3, 2.0, 2.1 |
| Analyzable signals | CH1 to CH4, M1 to M4 |
| Bit rate | 19.2 kbps, 9.6 kbps, 4.8 kbps, 2.4 kbps, 1.2 kbps, User Define (an arbitrary bit rate from 1 kbps to 20 kbps with resolution of 10 bps) |
| LIN bus trigger modes | Break Synch, ID/Data, ID OR, Error |
| Analyzable no. of frames | 100000 frames max. |
| List display items | Analysis no., time from trigger position [Time (ms)], ID, ID-Field, Data, Checksum, Information |
| Auxiliary analysis functions | Field jump functions |

| **FlexRay Bus Signal Analysis Functions (/F03 Option)*6** | |
|---|---|
| Applicable bus | FlexRay Protocol Version 2.1 |
| Analyzable signals | CH1 to CH4, M1 to M4 |
| Bit rate | 10 Mbps, 5 Mbps, 2.5 Mbps |
| FlexRay bus trigger modes | Frame Start, Error, ID/Data, ID OR |
| Analyzable no. of frames | 5000 frames max. |
| List display items | Analysis no., time from trigger position [Time (ms)], Segment (Static or Dynamic), Indicator, FrameID, PayLoad length, Cycle count, Data, Information |

| **SENT Signal Analysis Functions (/F04 Option)*6** | | |
|---|---|---|
| Applicable standard | | J2716 APR2016 and older |
| Analyzable signals | | CH1 to CH4, Logic input, or M1 to M4 |
| Clock period | | 1 µs to 100 µs with resolution of 0.01 µs |
| Data type | Fast channel | Nibbles/User Defined |
| | Slow channel | Short/Enhanced |
| SENT trigger modes | | Every Fast CH, Fast CH Status & Communication, Fast CH Data, Every Slow CH, Slow CH ID/Data, Error |
| Analyzable no. of frames | | 10000 frames max. |
| List display items | Fast channel | Analysis no., time from trigger position [Time (ms)], Sync/Cal period, Tick, Status & Comm, Data, CRC, frame length, Information |
| | Slow channel | Analysis no., time from trigger position [Time (ms)], ID, Data, CRC, information |

| | |
|---|---|
| Auxiliary analysis functions | Trend functions (up to 4 trend waveforms) |

| **CXPI Bus Signal Analysis Functions (/F05 Option)*6** | |
|---|---|
| Applicable bus | CXPI JASO D 015-3:2015 |
| Analyzable signals | CH1 to CH4, M1 to M4 |
| Bit rate | 19.2 kbps, 9.6 kbps, 4.8 kbps, User Define (an arbitrary bit rate from 4 kbps to 50 kbps with resolution of 10 bps) |
| Analyzable no. of frames | 10000 frames max. |
| List display items | Analysis no., time from trigger position [Time (ms)], ID, DLC, W/S, CT, Data, CRC, error information, Wakeup/Sleep |

| **GP-IB (/C1 Option)** | |
|---|---|
| Electromechanical specifications | Conforms to IEEE std. 488-1978 (JIS C 1901-1987) |
| Protocol | Conforms to IEEE std. 488.2-1992 |

| **Auxiliary Input** | |
|---|---|
| Rear panel I/O signal | External trigger input, External trigger output, GO/NO-GO output (/C1 Option), Video output |
| Probe interface terminal (front panel) | 2 terminals (DLM30x2), 4 terminals (DLM30x4) |
| Probe power terminal (rear panel) | 2 terminals (/P2 option), 4 terminals (/P4 option) |

| **Internal Storage (Standard model, /C8 Option)** | |
|---|---|
| Capacity | Standard model: Approx. 300 MB, /C8 option: Approx. 60 GB |

| **Built-in Printer (/B5 Option)** | |
|---|---|
| Built-in printer | 112 mm wide, monochrome, thermal |

| **USB Peripheral Connection Terminal** | |
|---|---|
| Connector | USB type A connector × 2 (front panel × 1, rear panel × 1) |
| Electromechanical specifications | USB 2.0 compliant |
| Supported transfer standards | High Speed, Full Speed, Low Speed |
| Supported devices | USB Printer Class Ver. 1.0 compliant HP (PCL) inkjet printers, USB Mass Storage Class Ver. 1.1 compliant mass storage devices (Usable capacity: 8 TB, Partition format: GPT / MBR, File format: exFAT / FAT 32 / FAT 16)<br>* Please contact your local YOKOGAWA sales office for model names of verified devices |

| **USB-PC Connection Terminal** | |
|---|---|
| Connector | USB type B connector × 1 |
| Electromechanical specifications | USB 3.0 compliant |
| Supported transfer standards | Super Speed, High Speed, Full Speed |
| Supported class | USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0) |

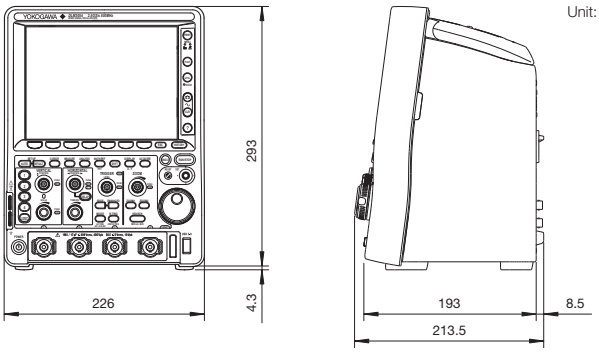
| **Ethernet** | |
|---|---|
| Connector | RJ-45 connector × 1 |
| Transmission methods | Ethernet (1000BASE-T/100BASE-TX/10BASE-T) |
| Supported services | Server: FTP, VXI-11, Socket<br>Client: FTP, SMTP, SNTP, LPR, DHCP, DNS |

| **General Specifications** | |
|---|---|
| Rated supply voltage | 100 to 120 VAC/220 to 240 VAC (Automatic switching) |
| Rated supply frequency | 50 Hz/60 Hz |
| Maximum power consumption | 180 VA |
| External dimensions | 226 (W) × 293 (H) × 193 (D) mm (when printer cover is closed, excluding protrusions) |
| Weight | Approx. 4.2 kg, With no options |
| Operating temperature range | 5℃ to 40℃ |

*1: Measured under standard operating conditions after a 30-minute warm-up followed by calibration.
Standard operating conditions: Ambient temperature: 23℃±5℃, Ambient humidity: 55±10% RH
Error in supply voltage and frequency: Within 1% of rating
*2: Value in the case of repetitive phenomenon. The frequency bandwidth of a single-shot phenomenon is the smaller of the two values, DC to sampling frequency/2.5 or the frequency bandwidth of the repetitive phenomenon.
*3: When the input section is shorted, the acquisition mode is set to Normal, accumulation is OFF, and the probe attenuation is set to 1:1.
*4: The LCD may include a few defective pixels (within 3 ppm over the total number of pixels including RGB).
*5: GO/NO-GO terminal is included in /C1 option.
*6: For 4 ch model only.

**External Dimensions**

Unit: mm



## Model and Suffix Codes

| Model*1 | Suffix code | Description |
|---|---|---|
| DLM3022 | | Digital Oscilloscope: 2 ch, 200 MHz |
| DLM3024*2 | | Mixed Signal Oscilloscope: 4 ch, 200 MHz |
| DLM3032 | | Digital Oscilloscope: 2 ch, 350 MHz |
| DLM3034*2 | | Mixed Signal Oscilloscope: 4 ch, 350 MHz |
| DLM3052 | | Digital Oscilloscope: 2 ch, 500 MHz |
| DLM3054*2 | | Mixed Signal Oscilloscope: 4 ch, 500 MHz |
| Power cord | -D | UL/CSA Standard and PSE compliant |
| | -F | VDE/Korean Standard |
| | -Q | British Standard |
| | -R | Australian Standard |
| | -H | Chinese Standard |
| | -N | Brazilian Standard |
| | -T | Taiwanese Standard |
| | -B | Indian Standard |
| | -U | IEC Plug Type B |
| Language | -HJ | Japanese message and panel |
| | -HE | English message and panel |
| | -HC | Chinese message and panel |
| | -HG | German message and panel |
| | -HF | French message and panel |
| | -HK | Korean message and panel |
| | -HL | Italian message and panel |
| | -HS | Spanish message and panel |
| Option | /LN | No switchable logic input (4 ch model only) |
| | /B5 | Built-in printer (112 mm) |
| | /M1*3 | Memory expansion option (4 ch model only)<br>During continuous measurement: 25 Mpoints; Single mode: 125 Mpoints/250 Mpoints*4 |
| | /M2*3 | Memory expansion option (4 ch model only)<br>During continuous measurement: 50 Mpoints; Single mode: 250 Mpoints/500 Mpoints*4 |
| | /P2*5 | 2 probe power terminals (for 2 ch model) |
| | /P4*5 | 4 probe power terminals (for 4 ch model) |
| | /C1 | GP-IB interface + GO/NO-GO terminal |
| | /C8 | Internal storage (60 GB) |
| | /G02 | User-defined math function (4 ch model only) |
| | /G03 | Power supply analysis function (4 ch model only) |
| | /F01 | UART + I²C + SPI trigger and analysis (4 ch model only) |
| | /F02 | CAN + CAN FD + LIN trigger and analysis (4 ch model only) |
| | /F03 | FlexRay trigger and analysis (4 ch model only) |
| | /F04 | SENT trigger and analysis (4 ch model only) |
| | /F05 | CXPI trigger and analysis (4 ch model only) |

**Standard Main Unit Accessories**
Power cord, Passive probe*6, Protective front cover, Panel sheet*7, Soft carrying case for probes, Printer roll paper (for /B5 option), User's manuals*8

*1: Standard memory capacity: During continuous measurement: 12.5 Mpoints; Single mode: 50 Mpoints/125 Mpoints (when odd channels only)
*2: Logic probes sold separately. Please order the model 701988/701989 accessory logic probes separately.
*3: When select from these options, please select only one.
*4: When odd channels only
*5: Specify this option when using current probes or other differential probes that don't support probe interface.
*6: 701937, per number of channels.
*7: Except suffix code "-HE".
*8: Start guide as the printed material, and User's manual as CD-ROM are included.

## Accessory Models

| Name | Model | Specification |
|---|---|---|
| Logic probe (PBL100) | 701988 | 1 MΩ input resistance, toggle frequency of 100 MHz |
| Logic probe (PBL250) | 701989 | 100 kΩ input resistance, toggle frequency of 250 MHz |
| Passive probe*1 | 701937 | 10 MΩ (10:1), 500 MHz, 1.3 m |
| FET probe*1 | 700939 | DC to 900 MHz bandwidth, 2.5 MΩ/1.8 pF |
| 100:1 voltage probe | 701944 | DC to 400 MHz bandwidth, 1.2 m, 1000 Vrms |
| 100:1 voltage probe | 701945 | DC to 250 MHz bandwidth, 3 m, 1000 Vrms |
| Differential probe | 701920 | DC to 500 MHz bandwidth, max. ±12 V |
| Differential probe | 701921 | DC to 100 MHz bandwidth, max. ±700 V |
| Differential probe | 701922 | DC to 200 MHz bandwidth, max. ±20 V |
| Differential probe (PBDH1000) | 701924 | DC to 1 GHz bandwidth, 1MΩ, max. ±25 V |
| Differential probe | 701926 | DC to 50 MHz bandwidth, 5000 Vrms/7000 Vpeak |
| Differential probe (PBDH0150) | 701927 | DC to 150 MHz bandwidth, max. ±1400 V |
| Differential probe | 700924 | DC to 100 MHz bandwidth, max. ±1400 V |
| Differential probe | 700925 | DC to 15 MHz bandwidth, max. ±500 V |
| Current probe*2 | 701917 | DC to 50 MHz bandwidth, 5 Arms, High-sensitivity |
| Current probe*2 | 701918 | DC to 120 MHz bandwidth, 5 Arms, High-sensitivity |
| Current probe (PBC050)*2 | 701929 | DC to 50 MHz bandwidth, 30 Arms |
| Current probe (PBC100)*2 | 701928 | DC to 100 MHz bandwidth, 30 Arms |
| Current probe*2 | 701930 | DC to 10 MHz bandwidth, 150 Arms |
| Current probe*2 | 701931 | DC to 2 MHz bandwidth, 500 Arms |
| Deskew correction signal source | 701936 | For deskew correction |
| Go/No-Go Cable | 366973 | For GO/NO-GO output terminal |
| Printer roll paper | B9988AE | Lot size is 10 rolls, 10 meters each |
| Probe stand | 701919 | Round base, 1 arm |
| Soft carrying case | 701964 | With 3 pockets for storage |

*1: Please refer to the Probes and Accessories brochure for probe adapters.
*2: Current probes' maximum input current may be limited by the number of probes used at a time.

## Accessory Software

| Model | Name | Specification |
|---|---|---|
| 701992-SP01 | Xviewer | Standard version |
| 701992-GP01 | | With MATH functions |

## Additional Option License for DLM3000*1

| Model | Suffix code | Description |
|---|---|---|
| 709811 | -G02 | User defined math |
| | -G03 | Power supply analysis function |
| | -F01 | UART + I²C + SPI trigger and analysis |
| | -F02 | CAN + CAN FD + LIN trigger and analysis |
| | -F03 | FlexRay trigger and analysis |
| | -F04 | SENT trigger and analysis |
| | -F05 | CXPI trigger and analysis |

*1: Separately sold license product (customer-installable). (4 ch model only)

NOTICE
● Before operating the product, read the user's manual thoroughly for proper and safe operation.

This is a Class A instrument based on Emission standards EN61326-1 and EN55011, and is designed for an industrial environment. Operation of this equipment in a residential area may cause radio interference, in which case users will be responsible for any interference which they cause.

YOKOGAWA

https://tmi.yokogawa.com/

YMI-KS-MI-SE06

**YOKOGAWA TEST & MEASUREMENT CORPORATION**
*Global Sales Dept.* /Phone: +81-422-52-6237 E-mail: tm@cs.jp.yokogawa.com
Facsimile: +81-422-52-6462

The contents in this catalog is as of February 2019. Subject to change without notice.
Copyright © 2018, Yokogawa Test & Measurement Corporation
[Ed: 02/b]
Printed in Japan, 902(KP)

**YOKOGAWA CORPORATION OF AMERICA** E-mail: tmi@us.yokogawa.com
**YOKOGAWA EUROPE B.V.** Phone: +31-88-4641000 E-mail: tmi@nl.yokogawa.com
**YOKOGAWA SHANGHAI TRADING CO., LTD.** Phone: +86-21-6239-6363 E-mail: tech@ysh.com.cn Facsimile: +86-21-6880-4987
**YOKOGAWA ELECTRIC KOREA CO., LTD.** Phone: +82-2-2628-3810 E-mail: TMI@kr.yokogawa.com Facsimile: +82-2-2628-3899
**YOKOGAWA ENGINEERING ASIA PTE. LTD.** Phone: +65-6241-9933 E-mail: TMI@sg.yokogawa.com Facsimile: +65-6241-9919
**YOKOGAWA INDIA LTD.** Phone: +91-80-4158-6396 E-mail: tmi@in.yokogawa.com Facsimile: +91-80-2852-1442
**YOKOGAWA ELECTRIC CIS LTD.** Phone: +7-495-737-78-68 E-mail: info@ru.yokogawa.com Facsimile: +7-495-737-78-69
**YOKOGAWA AMERICA DO SUL LTDA.** Phone: +55-11-3513-1300 E-mail: tm@br.yokogawa.com
**YOKOGAWA MIDDLE EAST & AFRICA B.S.C(c)** Phone: +973-17-358100 E-mail: help.ymatmi@bh.yokogawa.com Facsimile: +973-17-336100