



SCOPE CORDER

**Versatility  
to discover more**

**DL950  
ScopeCorder  
SL2000  
High-Speed Data Acquisition Unit**



Precision Making

Bulletin DL950-SL2000-01EN

**Efforts to protect the global environment, as represented by the United Nations Sustainable Development Goals (SDGs), are spreading on a global scale. In order to achieve a decarbonized society and eliminate the need for fossil fuels, new renewable energy sources and energy efficient technologies for transportation, home, and industrial appliances are being developed.**

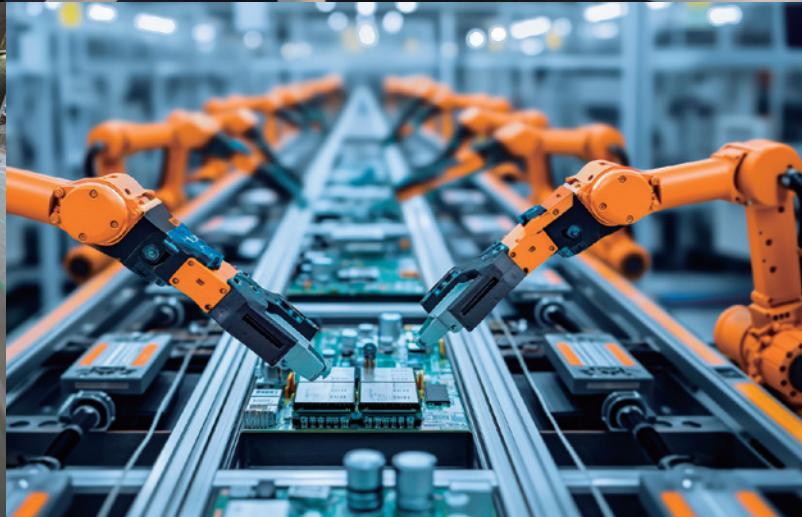
**To reduce energy loss and improve design efficiency, engineers need deep insights into both electrical and mechanical system behavior. The DL950 and SL2000 captures and analyzes a wide variety of electrical, physical sensor signals and serial buses. It offers a unique combination of high sampling rates, for a detailed view and long recording times to monitor trends over time.**

**The DL950 and SL2000 will quickly become the most valued instrument in your lab.**

**Insight** – Analyze detailed waveforms while continuously monitoring multiple channels over extended periods. The DL950 and SL2000 offer a unique combination of high-speed sampling and signal fidelity of an oscilloscope and the long-term data recording capabilities of a recorder. The DL950 and SL2000 measure signals at a high bit resolution and secures data in the harshest environments with superior noise-immunity and isolation technology.

**Versatility** – The eight input slots support over 20 module types, enabling simultaneous measurement of electrical signals, mechanical sensor outputs, and vehicle serial bus data. For even more channels, up to five DL950s or SL2000s can be synchronized.

**Usability** – A new application menu streamlines test setup, and a large touchscreen enhances ease of operation and visibility.



# Building on Legacy: The Pinnacle of Isolated High-Speed



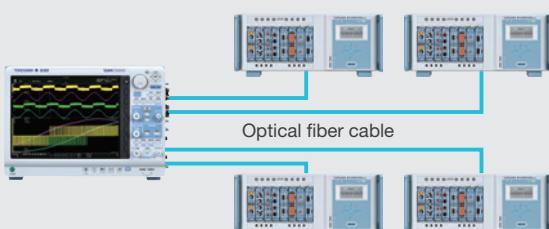
**DL950**



## Up to 160 channels

(4 CH Module, 5-unit Synchronized Connection /C50 Option)

Capture signals at speeds up to 200 MS/s, and scale to 160 channels by linking as many as five synchronized units.



## Real-time math function, Power math function, Motor dq analysis function

(/G03, /G05, /MT1 option)

Real-time waveform calculation, power calculation, and motor dq analysis are supported-including trigger conditions based on computed results.



# Oscilloscopes

SCOPE CORDER



SL2000

2007



SL1000

High-Speed Data Acquisition Unit

2025



SL2000

High-Speed Data Acquisition Unit

2006



SL1400  
ScopeCorder Lite

2010



DL850/DL850V  
ScopeCorder

2013



DL850E/DL850EV  
ScopeCorder

2021



DL950  
ScopeCorder

Plugin Module for ScopeCorder

## Plugin Modules for ScopeCorder

A variety of plug-in modules are available to measure signals such as voltage, temperature, acceleration, strain, and CAN bus data.



## Control Software Suitable for Long-Term Recording

IS8000 makes it easy to configure instruments and recording settings for standardized and long duration tests-without the need for complex programming.



# Versatile and integrated measurements

## High-speed sampling, multi-channel acquisition, and synchronized measurements-delivered by two platforms.

The DL950 is ideal for oscilloscope-style operation and waveform observation, while the rack-mountable SL2000 is designed for high-channel-count measurements, PC-based control, and long-term data recording.



## Plugin module for ScopeCorder please see pages 20 and 21



**200 MS/s 14 Bit Isolation Module**  
**720212**

- Isolated input of up to 1000 V
- ADC resolution 14-bit
- Wide band of 40 MHz
- Up to 20 seconds of continuous acquisition



**4-CH 10 MS/s 16 Bit Isolation Module**  
**720256**

- ADC resolution 16-bit
- Multipoint measurement of up to 32-CH by using eight slots
- Up to 160-CH by synchronizing multiple DL950s



Voltage  
100 MS/s  
**720211**



Voltage  
10 MS/s  
**720250**



Voltage  
1 MS/s  
**701251**



Voltage  
1 MS/s,  
4-CH input  
**720254**



Voltage  
10 MS/s,  
Non-isolated  
**701255**



Voltage  
1 MS/s,  
High voltage  
**720268**



Voltage  
200 kS/s,  
16 CH  
**720220**



Voltage,  
Temperature  
100 kS/s  
**701261**



Voltage,  
Temperature  
100 kS/s, with AAF  
**701262**



Voltage,  
Temperature  
High sensitivity  
**701265**



Voltage, Temperature  
High sensitivity,  
Low noise  
**720266**



Voltage,  
Temperature  
(scan method)  
**720221**



Strain  
NDIS  
**701270**



Strain  
DSUB  
**701271**



Acceleration,  
Voltage  
**701275**



Frequency  
**720281**



Logic  
**720230**

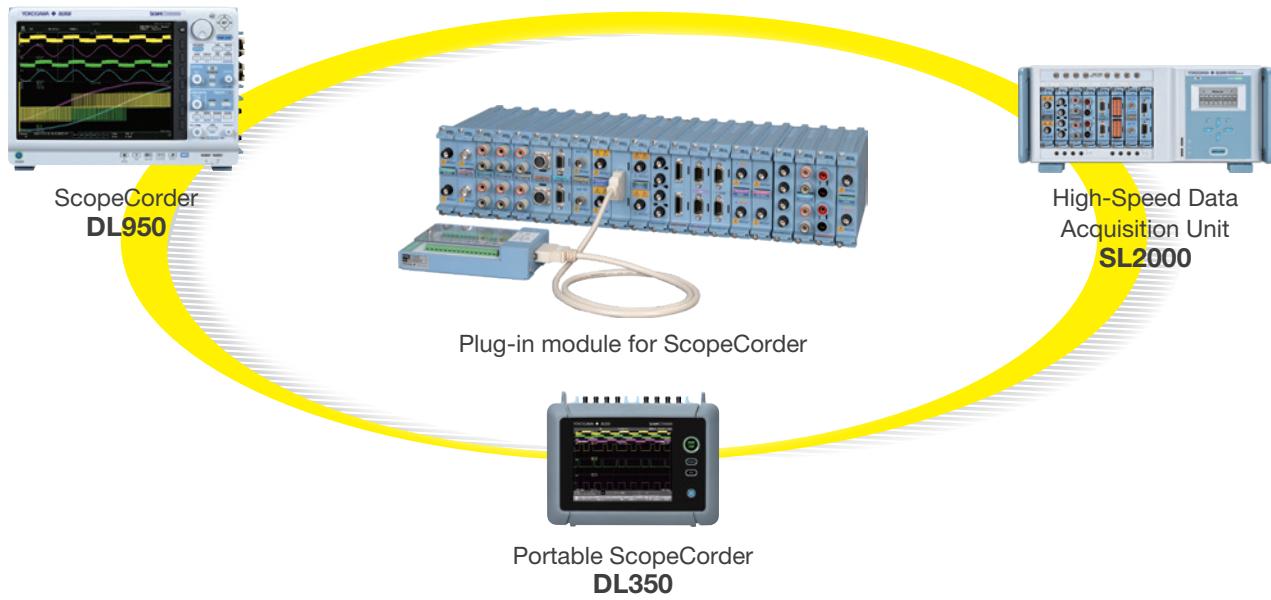


CAN/  
CAN FD/  
LIN  
**720245**



SENT  
**720243**

## Comparison of ScopeCorder products



	<b>DL950</b>	<b>SL2000</b>	<b>DL350</b>
Number of slots	8		2
Maximum analog channels	32 (4 CH module x 8) 128 (16 CH module x 8)		8 (4 CH module x 2) 32 (16 CH module x 2)
Maximum number of connected units	5		N/A
Maximum sample rate	200 MS/s		100 MS/s
Multi-sample	per channel		N/A
ADC resolution	12/14/16 bit		12/16 bit
Maximum input voltage		1000 V	
Maximum record length	4 G points		100 M points by module
PC streaming	10 GbE, Ethernet, USB		N/A
Input signal (Module types)	Voltage/Current, Temperature, Acceleration, Strain, Pulse, Logic* CAN/ CAN FD/ LIN/ SENT		
Included software	–	Includes 1 License for IS8002 Software (except when the /SN option is included)	–

\* Use a current probe for current measurement

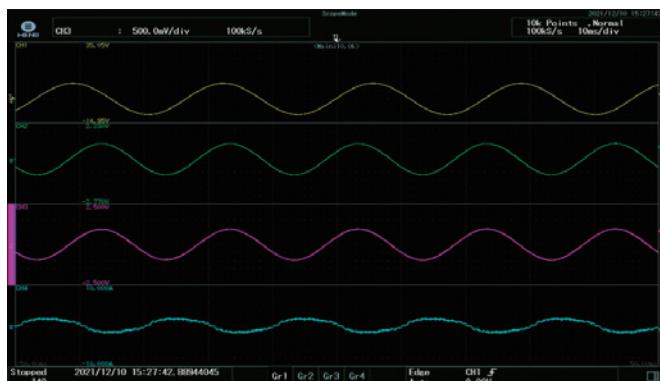
# Distinctive Features

## Two Operational Modes: Oscilloscope and Recorder

We offer two modes, "Scope Mode" and "Memory Recorder Mode," to suit various environments and applications.

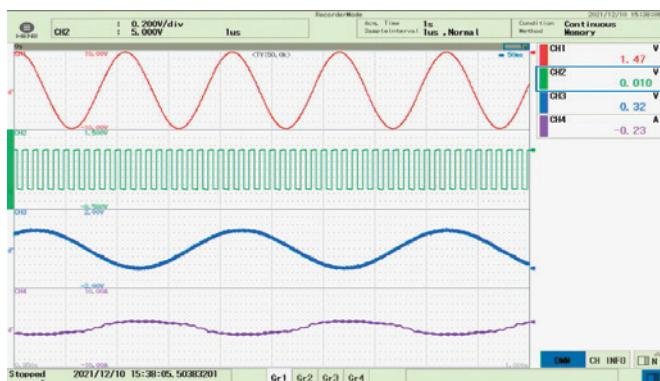
### Scope Mode

This mode is ideal for capturing high-speed signals and repetitive waveforms. Like an oscilloscope, it records waveforms based on trigger events, using the configured timebase (T/Div) and sampling point settings. The vertical axis is displayed in scale units (V/Div).



### Memory Recorder Mode

Ideal for long-duration waveform recording, this mode is similar to a data logger or recorder. It supports one-shot measurements based on predefined conditions or continuous logging by specifying the sampling interval and recording duration. The measurement range is displayed relative to the full scale, using upper and lower limits.



## Auto Setup Function for Stress-Free Configuration

If the signal amplitude or period is unknown, pressing 'Auto Setup' will automatically adjust the vertical and horizontal scales. Channels without an input will be automatically turned off.

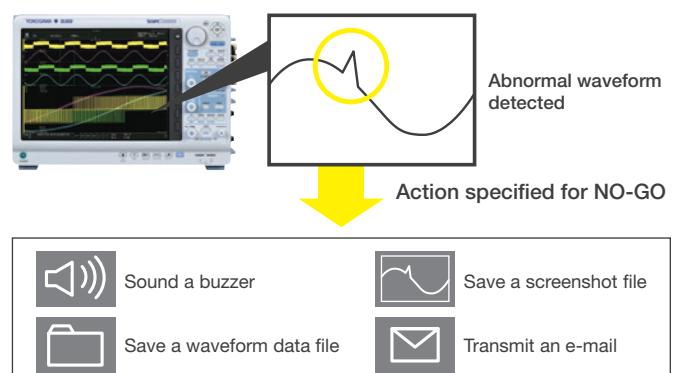


By executing Auto Setup, settings that match the input can be automatically configured.

\*Note: Some modules do not support Auto Setup.

## Action on trigger and GO/NO-GO judgement

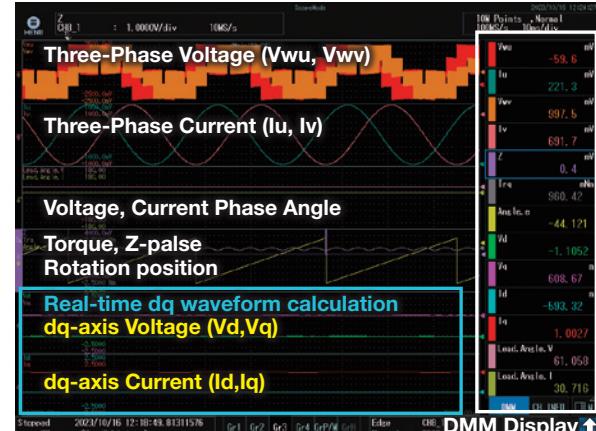
The Action on Trigger function automatically performs predefined tasks-such as saving data files, activating a buzzer, or sending email notifications-when a trigger condition is met. Additionally, it can perform pass/fail (GO/NO-GO) evaluations based on waveform parameters such as shape or amplitude, and execute actions based on the result.





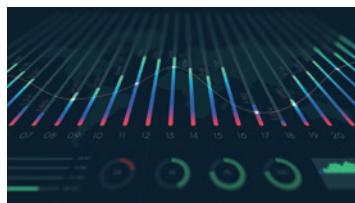
## Motor dq analysis (/MT1 option)

With the /MT1 option, the DL950 performs Park and Clarke transformations using motor voltage/current, battery DC signals, and rotational position. It can be calculated alongside other motor parameters, power measurement, and harmonic analysis. A single DL950 can also integrate additional measurements such as vibration, temperature, and CAN data.



## Power and harmonics analysis (/G05 or /MT1 option)

The DL950 or SL2000 supports comprehensive system evaluation by calculating power and conversion efficiency, analyzing harmonic distortion, and capturing mechanical variations such as speed and torque. This all-in-one capability makes it ideal for characterizing the dynamic behavior of power systems.



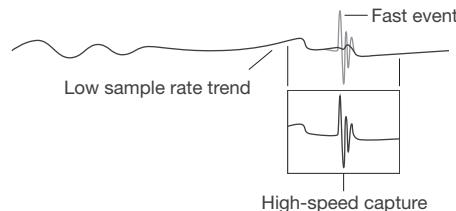
## Encoder rotary angle (/G03 or /G05 or /MT1 option)

The DL950/SL2000 can calculate the rotation angle from the pulses output from an encoder and display the trend of the rotation angle as a waveform. The rotation angle and its control signal can be simultaneously observed and inspected for abnormalities.



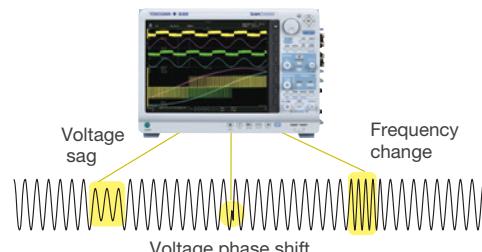
## Dual capture function

Durability testing requires capturing fast transient events with a high sample rate, even while monitoring low-speed signals to observe long-term trends. The dual capture function uniquely resolves these conflicting requirements by simultaneously recording at two different sample rates.



## Power line abnormality detection (Wave Window Trigger)

Special triggers are used to detect frequency fluctuations, voltage drops, and other phenomena that are difficult to detect with ordinary triggers. These triggers can also be used to detect typical power supply problems such as momentary power loss, sags, and surges.



## 8 G points large memory (/M2 option)

With up to 8 G points of memory and 20 seconds of continuous capturing, even at 200 MS/s, no signal changes are missed.

\*Up to 4 G points of memory is allocated per channel.

### Maximum capturable time to memory (with /M2 option)

Sample Rate	For 1 CH	For 2 CH	For 4 CH	For 8 CH	For 16 CH	For 32 CH
200 MS/s	20 s	20 s	10 s	5 s	2 s	1 s
100 MS/s	40 s	40 s	20 s	10 s	5 s	2 s
50 MS/s	1 m	1 m	40 s	20 s	10 s	5 s
20 MS/s	3 m 20 s	3 m 20 s	1 m 40 s	50 s	20 s	10 s
10 MS/s	5 m	5 m	3 m 20 s	1 m 40 s	50 s	20 s
1 MS/s	1 h	1 h	30 m	10 m	5 m	3 m 20 s

## SSD recording (/ST1 or /ST2 option)

The 512 GB internal SSD can record for long periods of time at up to 2 MS/s. Waveforms from dual capture can also be recorded, which is useful for in-vehicle endurance testing and capturing rare spontaneous events.

### Maximum capturable time to SSD (with /M2 option)

Sample Rate	For 1 CH	For 2 CH	For 4 CH	For 8 CH	For 16 CH	For 32 CH
2 MS/s	5 h	—	—	—	—	—
1 MS/s	10 h	10 h	—	—	—	—
200 kS/s	60 h	60 h	60 h	40 h	20 h	—
100 kS/s	5 days	5 days	5 days	3 days	40 h	20 h
10 kS/s	50 days	50 days	50 days	30 days	10 days	5 days
1 kS/s	50 days	50 days				

## Flash acquisition (/ST2 option)

Long time recording at up to 20 MS/s, which is 100 times faster than the previous model, is available. You can capture data anywhere you cannot bring a PC such as on-vehicle or field testing. The flash memory is non-volatile, so the captured data stays in the instrument even after turning off the power.

Data can later be transferred to a PC.

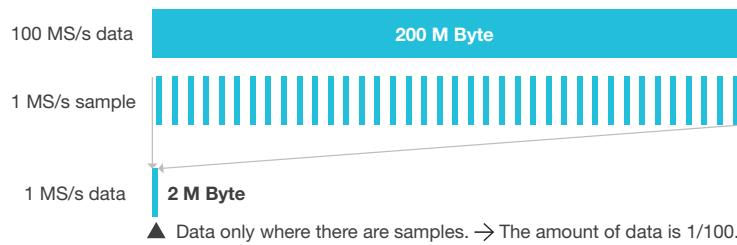
### Maximum capturable time by Flash acquisition (with /M2 option)

Sample Rate	For 1 CH	For 2 CH	For 4 CH	For 8 CH	For 16 CH	For 32 CH
20 MS/s	10 m	10 m	10 m	5 m	—	—
10 MS/s	30 m	30 m	30 m	10 m	5 m	—
5 MS/s	1 h	1 h	1 h	30 m	10 m	5 m
2 MS/s	2 h	2 h	2 h	1 h	40 m	10 m
1 MS/s	5 h	5 h	5 h	2 h	1 h	30 m

Deletion of the recorded data on the flash memory is not done for each recorded data but for all the data at once. When transferring recorded data to a PC, please use the IS8000 or re-save the data in WDF format.

## Multi-sample rates

Sample rates can be set by channel. Reducing the sample rate reduces the amount of data even when modules with high and low sample rates are mixed together. This allows for less memory space to be used and improves the transfer speed.

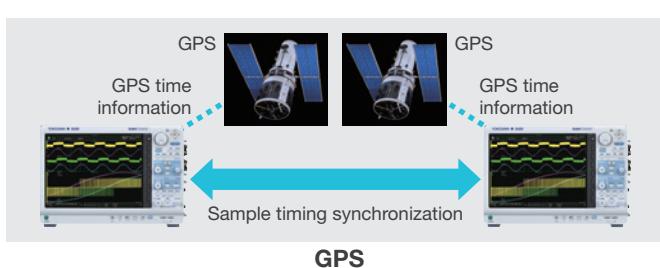
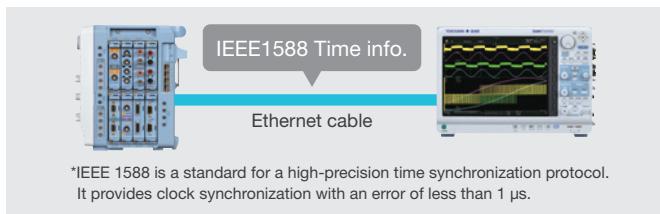


## Available Data Storage

- Built-in SSD 512 GB
- SD Memory Card (SD/SDHC/SDXC)
- USB Storage up to 8 TB
- Network Drive

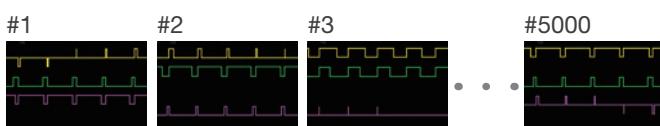
## Accurate time synchronization (/C35, /C40 option)

Time synchronization with IEEE1588 signals is available. With the /C40 option, the DL950 can output IEEE1588 master signals. Time synchronization using IRIG and GPS is also available (/C35 option).

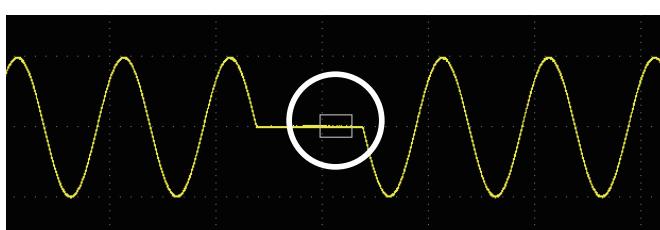


## Easily capture to abnormal waveforms

Abnormalities during repeated waveform measurements often go unnoticed until after they've occurred. With the DL950's ability to store up to 5,000 history waveforms in acquisition memory, you can review and analyze past events—even after they've passed.



You can quickly search the stored history waveforms and display only those that meet specific criteria. Conditions such as amplitude, frequency, or whether a waveform enters or avoids a defined zone can be used to isolate events of interest.



## Real-time data transfer to PC (/C60 option)

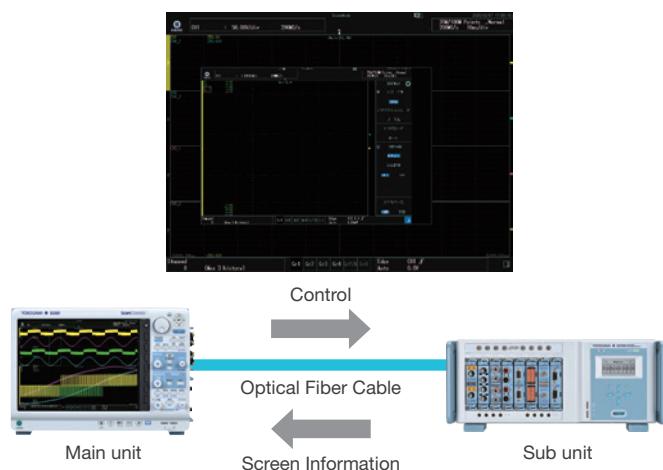
Using 10 Gbps Ethernet, up to 20 MS/s of data can be stored in real time on a PC. An SFP+ module, a fiber optic cord, and the PC software IS8000 are used for data transfer.



\*Please use a commercially available SFP+ module and a 10 GE fiber optic cord.  
\*When transferring files, high speed transfer is not possible.

## Channel expansion through synchronized operation (/C50 Option)

In multi-unit synchronization, up to four sub-units can be connected. Along with synchronized start/stop control and time alignment between units, the main unit can remotely display and operate the screen of one sub-unit at a time. Synchronization is supported between DL950 and SL2000 units in any combination. This function is also compatible with IS8000, the built-in web server, and video signal output.



## Additional Features

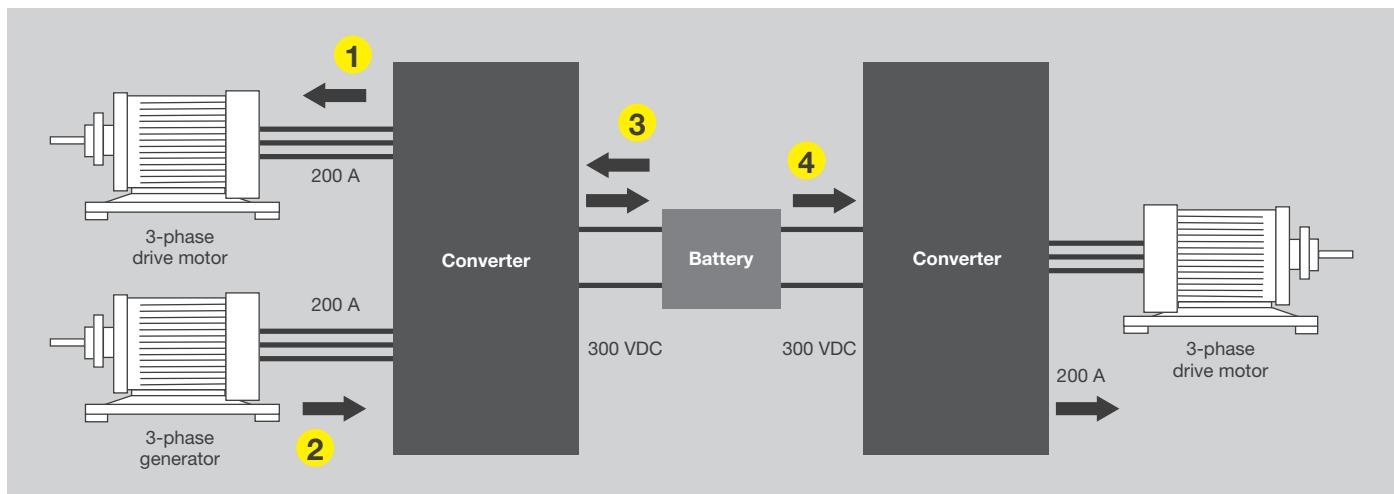
- Up to 8 Current Probe Power Supplies (/P4 or /P8 option)
- Connection for USB Mouse & Keyboard & External Printer

# Example Applications

Other application examples are on the Yokogawa Web site.

## 2-motor/4-motor system test for EV

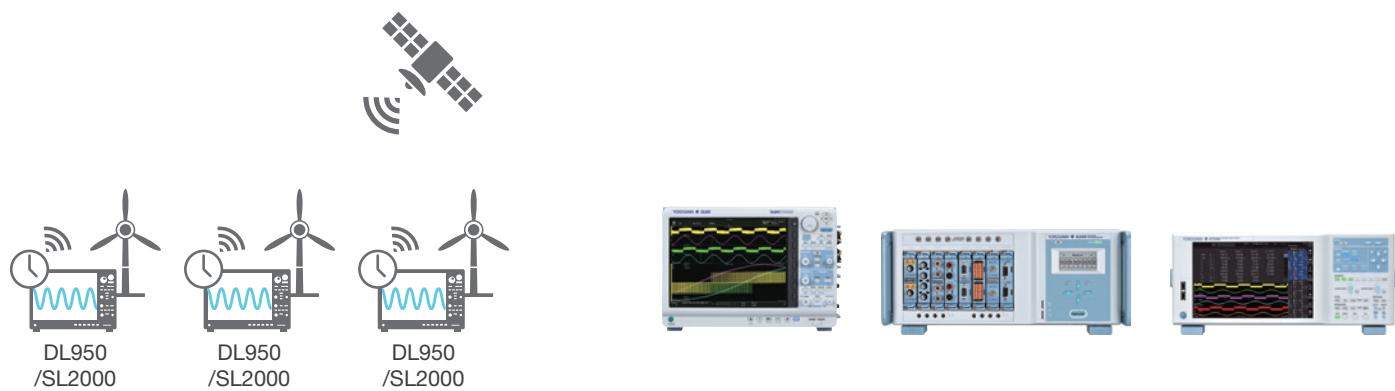
In Hybrid Electric Vehicle (HEV) development, two or four motor systems, with each motor connected to a driving wheel, are commonly used. This design eliminates traditional powertrains, simplifying the overall system and alleviating concerns when driving a 4WD on snowy roads. The multi-channel, high-speed, isolated DL950 can simultaneously capture and analyze signals from these multi-motor setups.



## Distributed energy resource test (Renewable energy)

Renewable energy sources like hydro, solar, and wind power are integrated into the power grid, driving the transition to a sustainable society. The DL950/SL2000 supports this transition with its long-term power recording and analysis capabilities. For example, wind turbines require synchronized monitoring of power generation efficiency at multiple locations, which can be achieved with high precision using GPS or IRIG signals.

Additionally, the DC/AC conversion efficiency of solar panel-generated DC power can be accurately measured using the WT5000 precision power analyzer, while the waveform data from the DL950/SL2000 can be seamlessly integrated with the WT5000's measurement data to provide a comprehensive analysis of inverter performance.



## Vibration and Acoustic Analysis

Vibration is inherent to "moving objects" such as motors and engines. Analyzing the frequency of vibrations to identify abnormal areas is an essential test in the development of "moving objects." By using multiple acceleration modules, Vibrations at multiple points can be simultaneously captured and up to eight vibration frequencies can be analyzed using FFT functionality to identify faulty components.

### Modules, accessories, and functions needed

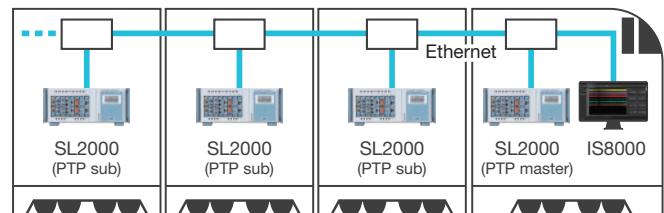
Acceleration module  
User-defined math function (/G02 option)  
Sensor (Acceleration · Noise Analysis)



## Railway Vehicle Running Test

By using the DL950 and SL2000, we can simultaneously record the voltage, current, and rotational speed of the battery, inverter, and drive motor, as well as the vibration and interior temperature of railway vehicles.

- Simultaneous measurement of remote devices with a synchronization accuracy of  $\pm 150$  ns (typ) when using the /C40 option.
- Distributed synchronous measurement with up to 160 channels
- Simultaneous recording of strain and sound (using voltage output microphones or sound level meters) is also possible
- Using power calculations and motor dq analysis, power efficiency and motor performance can be evaluated.



### Modules, accessories, and functions needed

Voltage, Temperature, and Acceleration Modules IEEE1588 Master Function (/C40 option)  
Multi-unit Synchronization Interface (/C50 option) Power Calculation (/G05 option)



## Vehicle Serial Bus Data Recording and Driving Trajectory Display

You can simultaneously view the trends of physical values from CAN/CAN FD bus data alongside the corresponding measured waveforms on the same screen. For example, you can verify the correlation between the ON/OFF signal of the ignition switch, the corresponding CAN/CAN FD signal, and the actual signals from related pressure sensors, all on the same screen. By connecting a GPS unit, Latitude, longitude, altitude, speed, direction, and time information can be added to the measurement data. Using DIAdem, you can simultaneously display the measurement data and driving position.

With IoT gateways or M2M routers, remote control and data monitoring can be performed wirelessly.

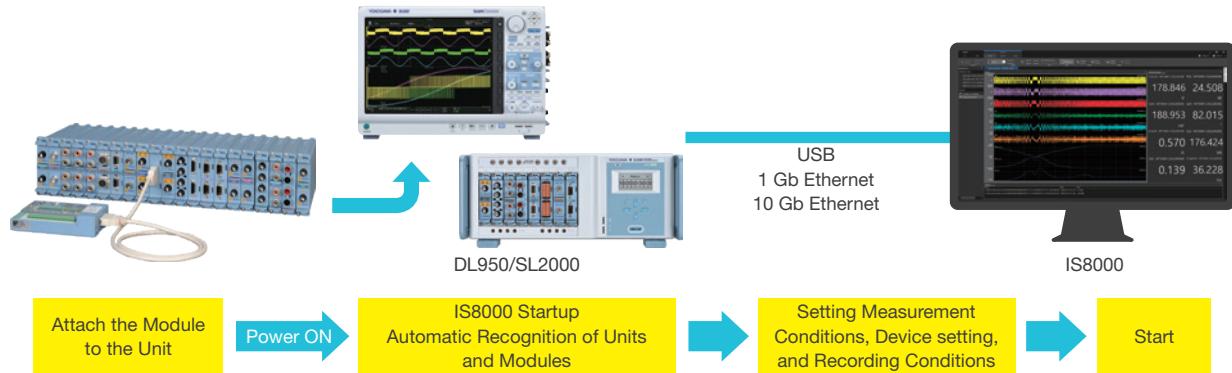
### Modules, accessories, and functions needed

CAN FD/LIN Monitor module, GPS unit, IRIG, GPS interface (/C35 option), serial bus analysis function (/VCE option)

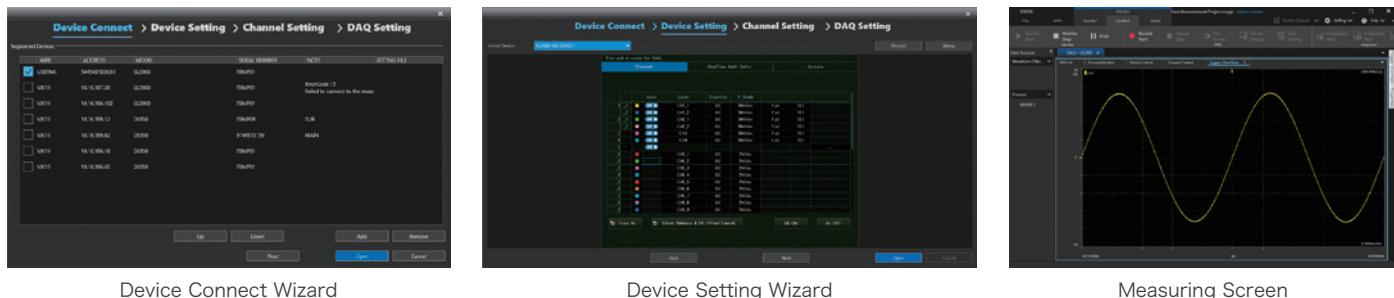
# Software

## Intuitive Acquisition Software

By using IS8000, you can start measurements immediately without complex settings. System setup, measurement conditions, display, and recording conditions can be easily configured through four wizard screens to begin measurements. The SL2000 includes IS8002 (1 license) bundled with it (excluding the /SN option).

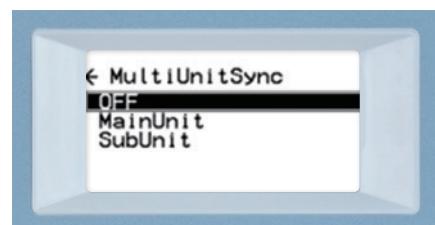
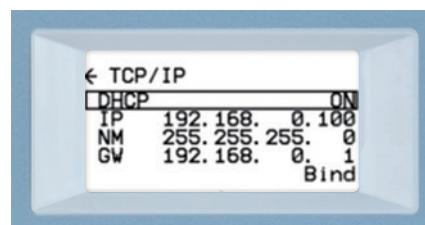
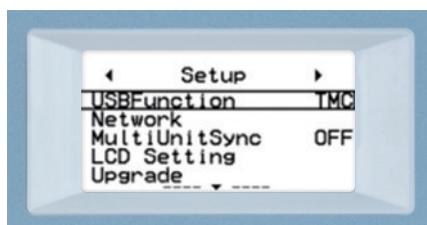


## Software Screen



We have simplified the configuration of essential settings for PC communication on the SL2000 main unit, ensuring seamless software connectivity. This allows you to get started quickly without the need for complicated setups.

- Switching between USB mass storage function and USB communication control
- Setting the Ethernet IP address
- Selecting Main/Sub unit when connecting multiple units



## Integrated measurement software platform IS8000

The IS8000 enables synchronized measurements with DL950/SL2000, Yokogawa power meters, other manufacturers' high-speed cameras, and other equipment. It supports measurement setting, remote monitoring, comparative analysis, and MDF file saving to reduce test system development time.

There is dedicated waveform display software called IS8002CDV Classic Data Viewer.

### SY1 Option

This option is necessary for controlling more than two measuring instruments and simultaneous data analysis.

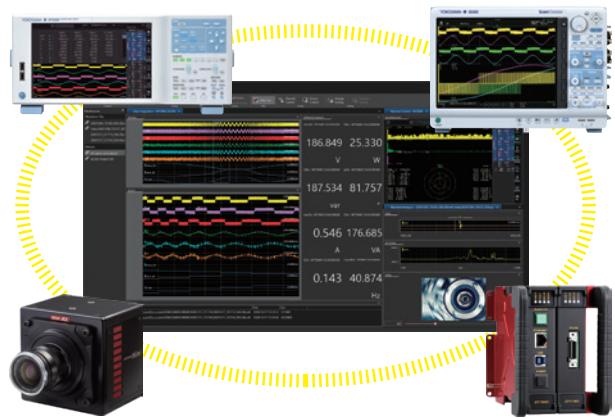
### MH1 Option

It is ideal for comparing and calculating multi-channel vibration and acoustic waveforms.

### SB1 Option

For CAN bus communication data analysis, decoding, frame display, and search are possible.

For detailed specifications of IS8000, please refer to Bulletin IS8000-01JA.



## ScopeCorder SDK (Software Development Kit)

This software offers an API (Application Programming Interface) for waveform data acquisition with DL950/SL2000, the API is provided as a Dynamic Link Library (DLL). By integrating this DLL into your custom application, you can easily leverage the API for automated measurements via PC control. It supports four key operations:

### Free Run Mode:

Continuously acquires data from the start to the stop of the waveform capture.

### Trigger Mode:

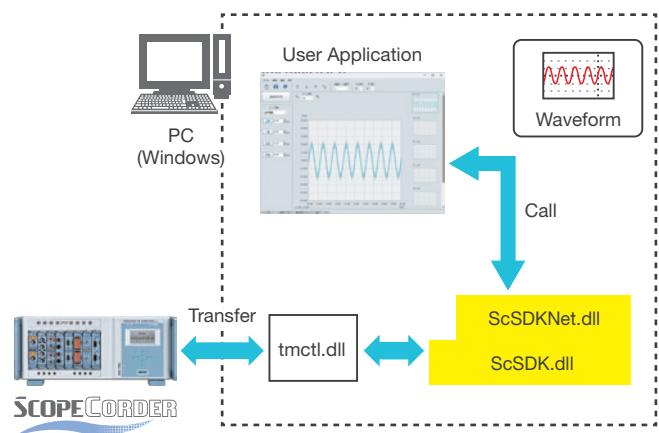
Captures waveforms based on a specified trigger event.

### Flash Acquisition Data Access Library Functionality:

Transfers recorded flash acquisition waveforms from the DL950/SL2000 to a PC.

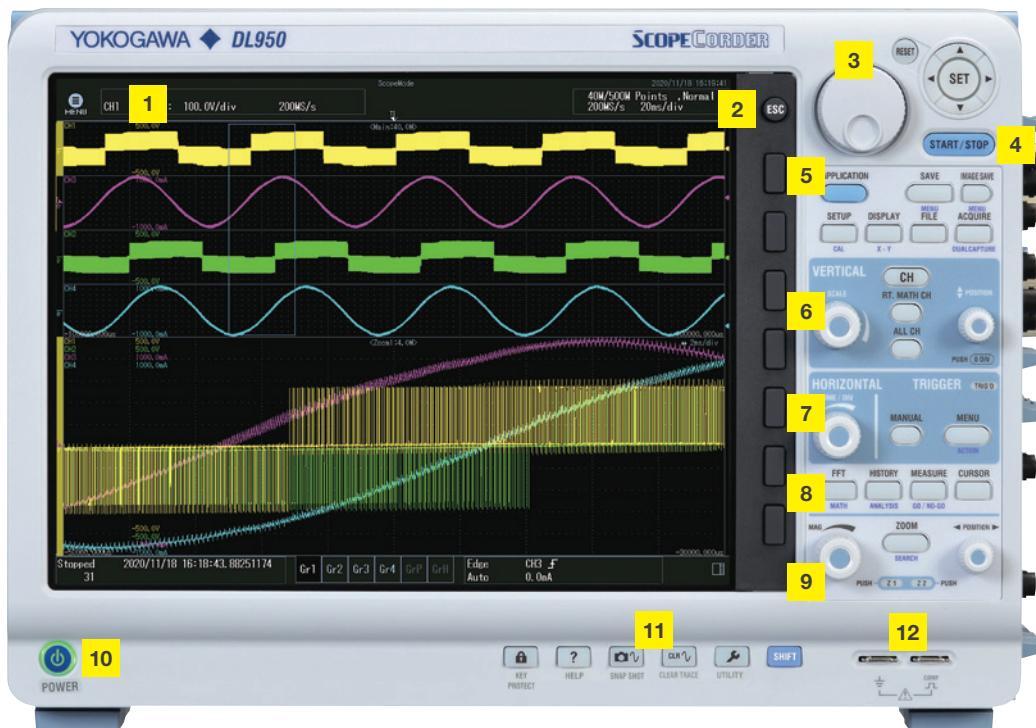
### File Operation and Transfer Functionality:

Transfers recorded waveforms from the DL950/SL2000 to a PC.



# DL950

## Intuitive control panel and connectivity



**1** High resolution 12.1-inch touch screen

**2** ESC key and soft keys

For moving in the menu and operating the soft menu

**3** Jog dial

**4** Capture start/stop key

**5** Application key

**6** Vertical axis setting keys/knobs

For input channel, real time math, and vertical axis resolution setting

**7** Horizontal axis control keys/knobs

For setting the time axis and trigger

**8** Analysis keys

For setting the FFT, cursor measurement, and so on

**9** Zoom control keys/knobs

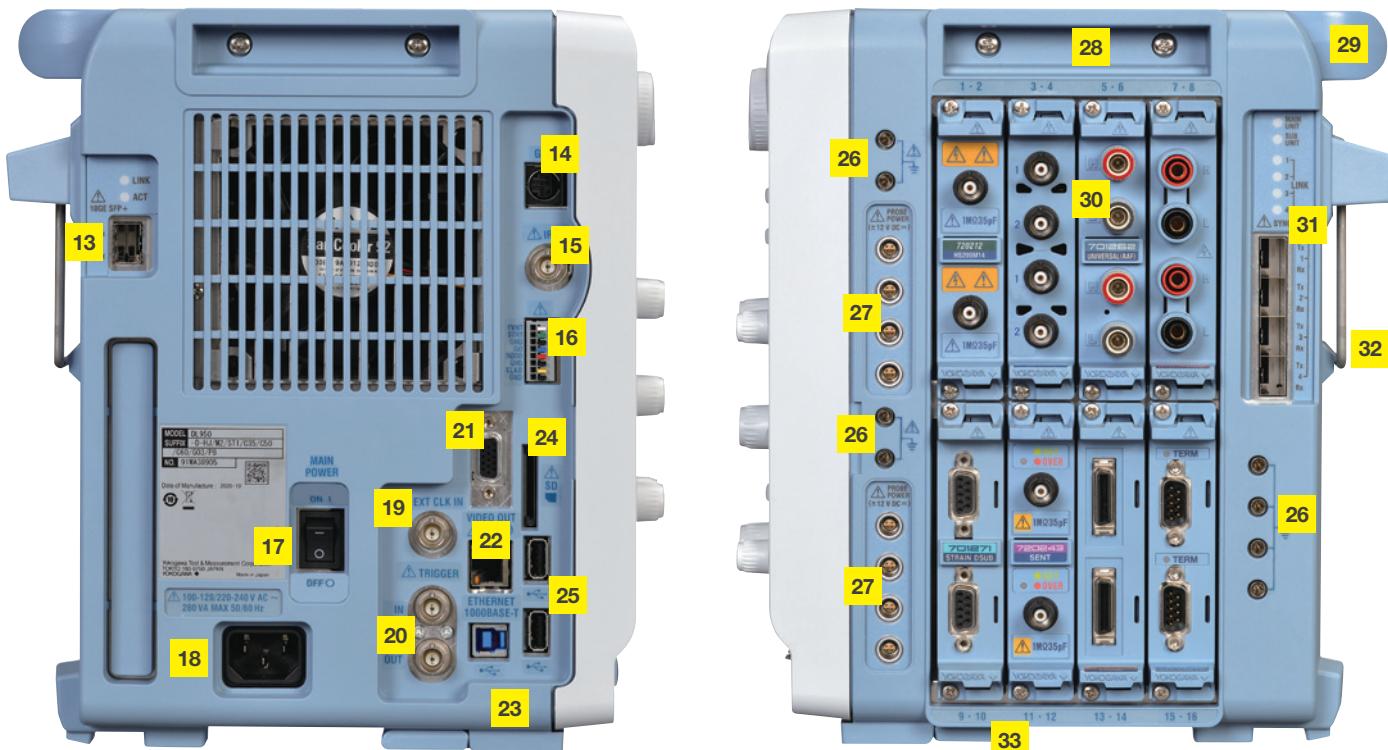
For setting the zoom display and zoom magnitude

**10** Power switch

**11** Other keys

Key protect, waveform screenshot, and utility menus

**12** Probe compensation signal output terminal



**13** 10 Gbps Ethernet terminal (/C60)

**14** GPS interface (/C35)

**15** IRIG interface (/C35)

**16** External I/O terminals

For outputting Go/No-Go result and control measurement start/stop signals

**17** Main power switch

**18** Power cord connector

**19** External clock input terminal

For sampling based on an external signal

**20** External trigger I/O terminals

**21** Video signal output terminal (D-sub 9-pin)

**22** 1000BASE-T Ethernet terminal

**23** USB-PC connection terminal (USB3.0)

**24** SD card slot

**25** USB ports for peripherals

**26** Functional ground terminals

**27** Probe power supply terminals (/P4 or /P8)

**28** Side grips

**29** Bar handle

**30** Input module slots

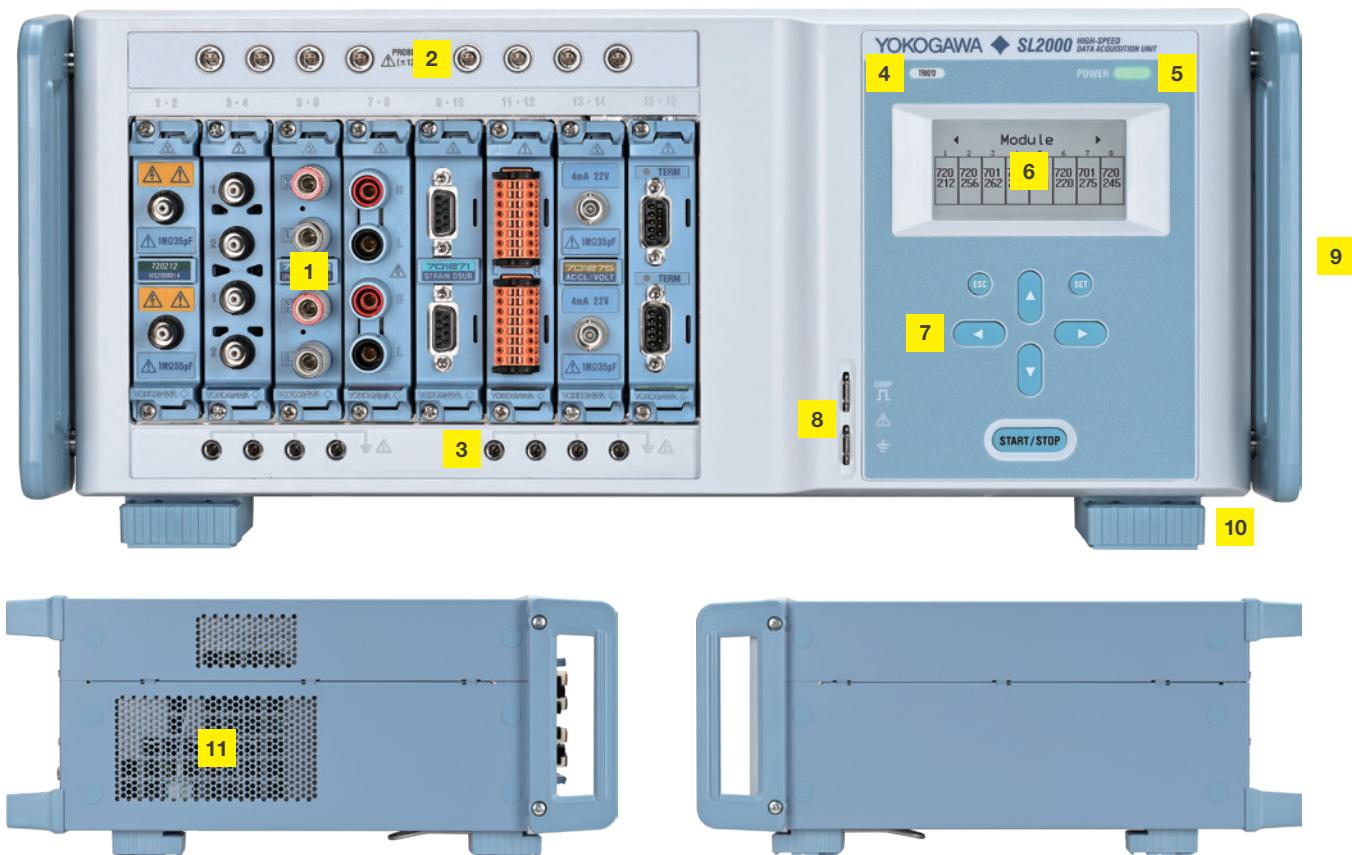
**31** Multi-unit synchronization interface (/C50)

**32** Rear stand

**33** Tilt legs

# SL2000

## Intuitive control panel and connectivity



**1** Input module slots

**2** Probe power supply terminals (/P4 or /P8)

**3** Functional ground terminals

**4** Trigger Indicator

Displays the trigger status.

**5** Power Indicator

Displays the power status.

**6** Screen

Displays the status of this device, communication parameters.

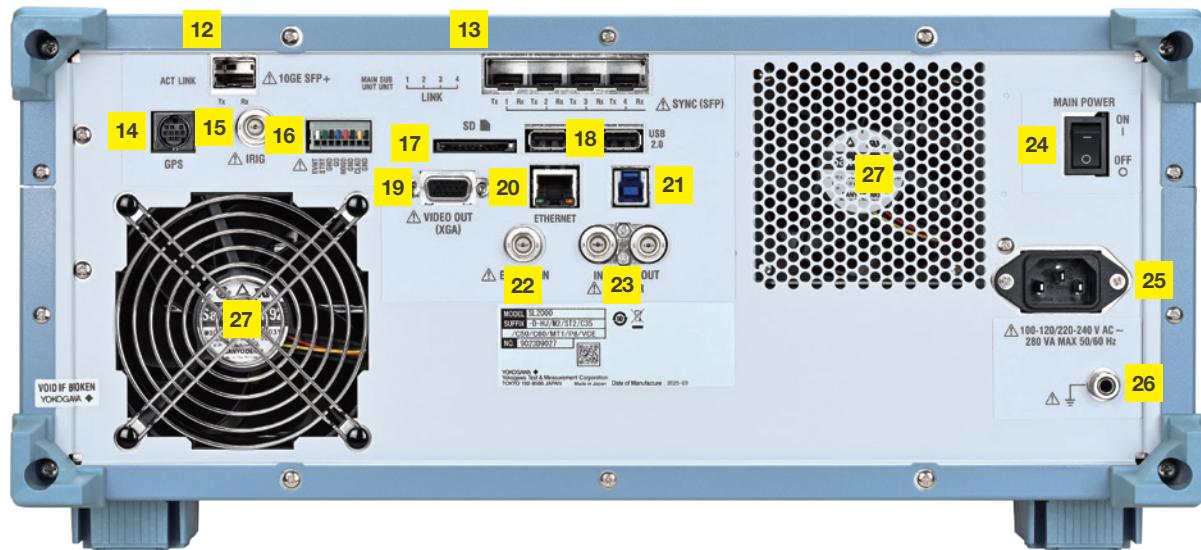
**7** Operation Keys

**8** Probe compensation signal output terminal

**9** Handle

**10** Tilt legs

**11** Air Intake



- 12 10 Gbps Ethernet terminal (C60)
- 13 Multi-unit synchronization interface (C50)
- 14 GPS interface (C35)
- 15 IRIG interface (C35)
- 16 External I/O terminals For outputting  
Go/No-Go result and control measurement start/stop signals
- 17 SD card slot
- 18 USB ports for peripherals (USB2.0)
- 19 Video signal output terminal (D-sub 9-pin)

- 20 1000BASE-T Ethernet terminal
- 21 USB-PC connection terminal (USB3.0)
- 22 External clock input terminal  
For sampling based on an external signal
- 23 External trigger I/O terminals
- 24 Main power switch
- 25 Power cord connector
- 26 Functional ground terminals
- 27 Cooling Fan (Exhaust)

# Plug-in modules

Input	Model No. <sup>1</sup>	Sample rate	Resolution	Bandwidth	Number of channels	Isolation	Maximum measurement voltage <sup>10</sup> (DC + ACpeak)	DC accuracy	Note
Analog Voltage	720212 <sup>9</sup>	200 MS/s	14 bit	40 MHz	2	Isolated	1000 V <sup>2</sup> , 200 V <sup>5</sup>	±0.5%	High speed, High voltage, Isolated
	720211 <sup>9</sup>	100 MS/s	12 bit	20 MHz	2	Isolated	1000 V <sup>2</sup> , 200 V <sup>5</sup>	±0.5%	High speed, High voltage, Isolated
	720250	10 MS/s	12 bit	3 MHz	2	Isolated	800 V <sup>2</sup> , 200 V <sup>5</sup>	±0.5%	high noise immunity
	701251	1 MS/s	16 bit	300 kHz	2	Isolated	600 V <sup>2</sup> , 140 V <sup>5</sup>	±0.25%	High sensitivity range (1 mV/div), low noise (±100 µVtyp.), and high noise immunity
	720256	10 MS/s	16 bit	3 MHz	4	Isolated	600 V <sup>2</sup> , 200 V <sup>5</sup>	±0.25%	4 CH BNC input low noise, high noise immunity
	720254	1 MS/s	16 bit	300 kHz	4	Isolated	600 V <sup>2</sup> , 200 V <sup>5</sup>	±0.25%	4 CH BNC input low noise, high noise immunity
	701255	10 MS/s	12 bit	3 MHz	2	Non-Isolated	600 V <sup>2</sup> , 200 V <sup>3</sup>	±0.5%	High speed - Non isolated
	720268	1 MS/s	16 bit	300 kHz	2	Isolated	1000 V <sup>11</sup>	±0.25%	With AAF, RMS, and high noise immunity
	720220	200 kS/s	16 bit	5 kHz	16	(GND-terminal) non-isolated (CH-CH)	20 V <sup>3</sup>	±0.3%	16 CH voltage measurement (Scan-type)
	701261	100 kS/s (Voltage), 500 S/s (Temperature)	16 bit (Voltage), 0.1°C (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	Thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel)
Analog Voltage & Temperature	701262	100 kS/s (Voltage), 500 S/s (Temperature)	16 bit (Voltage), 0.1°C (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	Thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), with AAF
	701265	500 S/s (Voltage), 500 S/s (Temperature)	16 bit (Voltage), 0.1°C (Temperature)	100 Hz	2	Isolated	42 V	±0.08 (Voltage)	Thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), high sensitivity range (0.1 mV/div)
	720266	125 S/s (Voltage), 125 S/s (Temperature)	16 bit (Voltage), 0.1°C (Temperature)	15 Hz	2	Isolated	42 V	±0.08 (Voltage)	Thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), high sensitivity range (0.1 mV/div), Low noise
	720221 <sup>8</sup>	10 S/s	16 bit	600 Hz	16	Isolated	20 V	±0.15% (Voltage)	16 CH voltage or temperature measurement (scan method) Thermocouple (K, E, J, T, L, U, N, R, S, B, W, Au-Fe-chromel)
Strain	701270	100 kS/s	16 bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain NDIS, 2, 5, 10 V built-in bridge power supply
	701271	100 kS/s	16 bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain DSUB, 2, 5, 10 V built-in bridge power supply, and shunt CAL
Analog Voltage, Acceleration	701275	100 kS/s	16 bit	40 kHz	2	Isolated	42 V	±0.25% (Voltage) ±0.5% (Acceleration)	Built-in anti-aliasing filter, Supports built-in amp type acceleration sensors (4 mA/22 V)
Frequency	720281	1 MS/s	16 bit	resolution 625 ps	2	Isolated	420 V <sup>2</sup> , 42 V <sup>3</sup>	±0.1% (Frequency)	Measurement frequency of 0.01 Hz to 500 kHz, Measured parameters (frequency, RPMs, RPSs, period, duty cycle, power supply frequency, pulse width, pulse integration, and velocity)
Logic	720230	10 MS/s	—	—	8 bit × 2 ports	Non-Isolated	depend on logic probe used.	—	(8 bit/port) × 2, compatible with four-type of logic probe (sold separately)
CAN/CAN FD/LIN	720245	100 kS/s	—	—	(60 signals × 2) port	Isolated	10 V (CAN port) 18 V (LIN port)	—	CAN/CAN FD port × 2, CAN/CAN FD Data of maximum 32-bit allowable, LIN port × 2 CAN FD/LIN switchable on each port separately Available for DL950/VCE and DL350 /VE option. <sup>6,7</sup>
SENT	720243	100 kS/s	—	—	11 data × 2 ports	Isolated	42 V	—	Supported protocol: SAE J2716. <sup>6,7</sup>

\*1: Probes are not included with any modules. \*2: In combination with 700929, 702902 or 701947 probe. \*3: Direct input \*4: In combination with 10:1 probe model 701940 \*5: In combination with 701901 + 701954.

\*6: Any other modules can be installed in the remaining slots. \*7: When using these modules with DL950/VCE, up to four CAN/CAN FD Monitor Modules (720242), CAN & LIN Bus Monitor Modules (720241) or SENT Monitor Module (720243) in total can be used on a single main unit. For the CAN FD/LIN Monitor Module (720245), CAN/CAN FD Monitor Module (720242) and CAN & LIN Bus Monitor Module (720241), up to two in total can be used on a single main unit. 720241, 720242 and 720245 can be installed in slots 7 and 8. 720243 can be installed in slots 5 to 8. \*8: The 16 CH Scanner Box (701953) is required for measurement. \*9: Class 1 Laser Product, IEC60825-1:2014+A11:2021, IEC 60825-1:2014, GB 7247.1-2024 \*10: See the main specifications for voltage-axis sensitivity setting and measurement range.

\*11: In combination with 758933 and 701954. 1000 Vrms (1000 VDC or 1414 Vpeak maximum) See Bulletin DL950-02EN for more details about the modules.

The DL950, SL2000, 720212, and 720211 use an Internal laser light source.

CLASS 1 LASER PRODUCT  
クラス1レーザー製品  
1类激光产品

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019.  
4-9-8 Myojin-cho, Hachioji-shi,  
Tokyo 192-8566, Japan

## Accessories



Optical Transceiver Module  
1000BASE-SX SFP module  
850 nm  
**720941**



GPS Unit  
**720940**

Probe stand  
**701919**



Optical Fiber Cord  
Multi mode optical fiber  
(LC-LC/3 m)  
**720941**

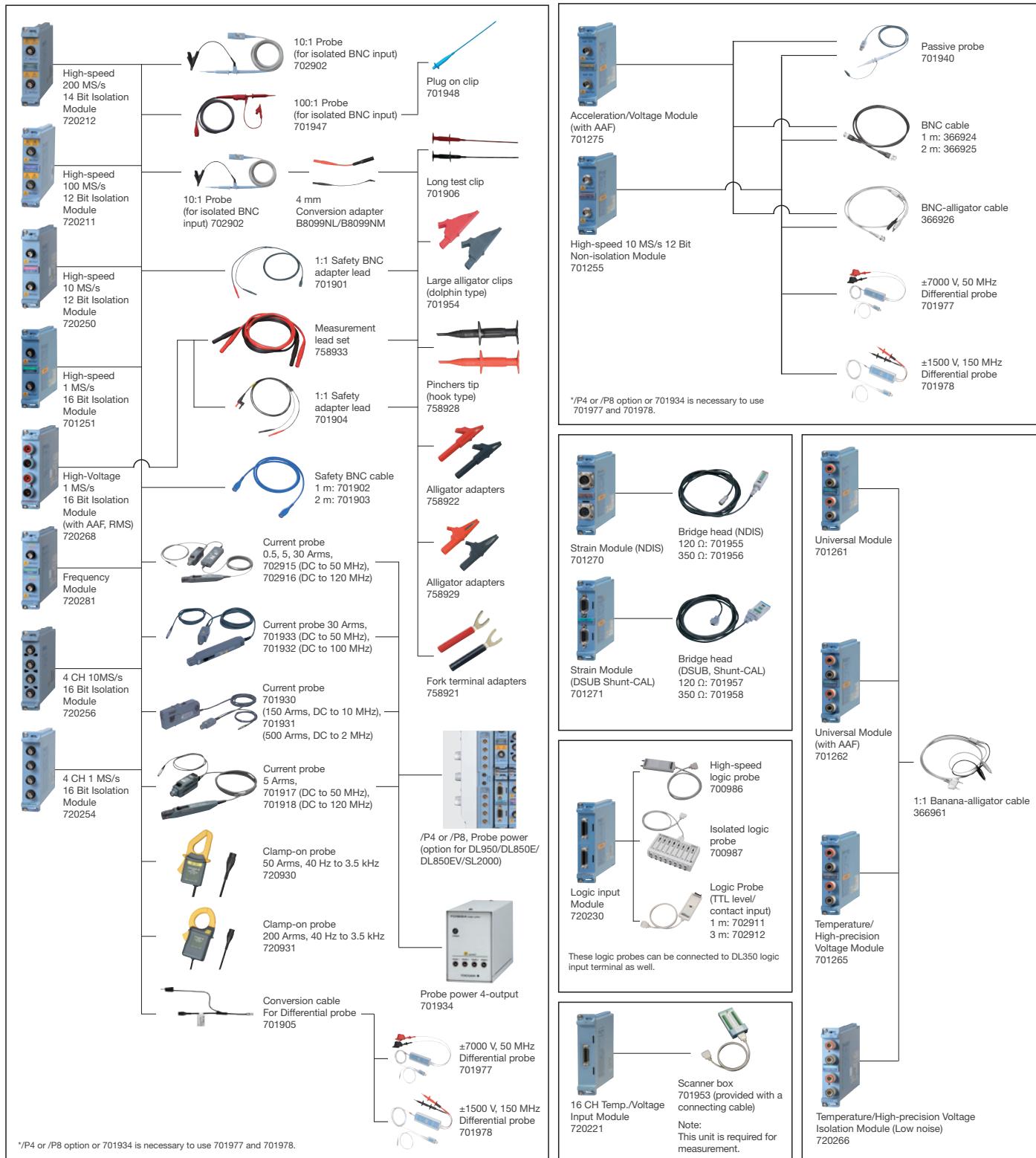


Conversion cable  
(for differential probe)  
**701905**



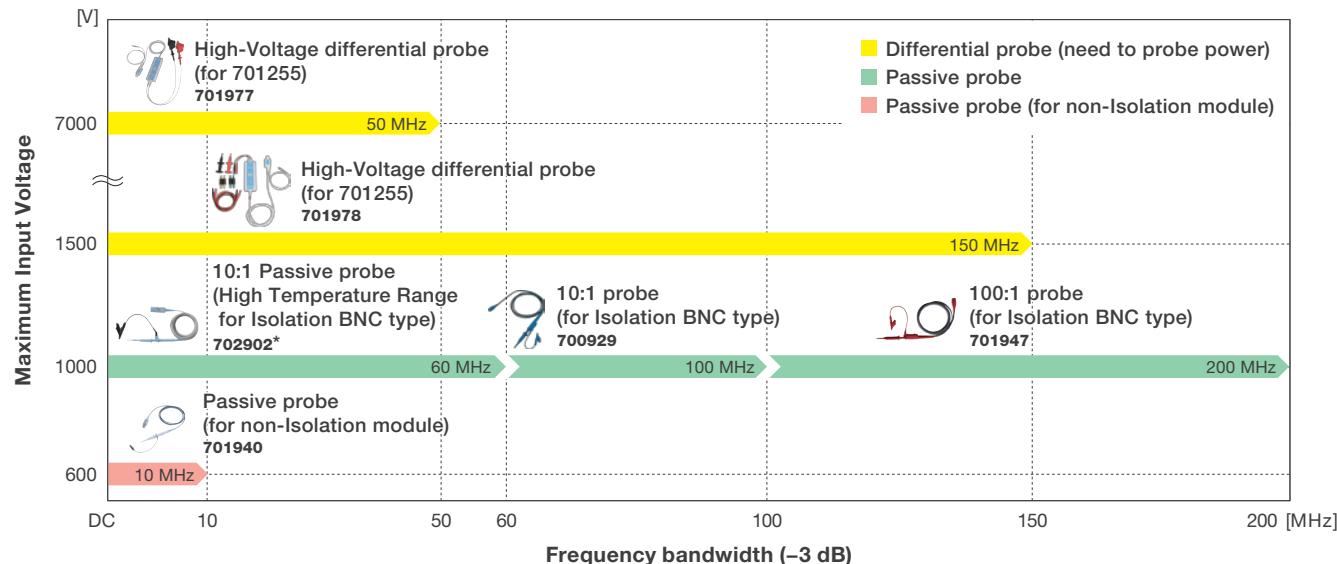
Soft carrying case  
for DL950  
**701972**

# Combination of modules and probes/accessories

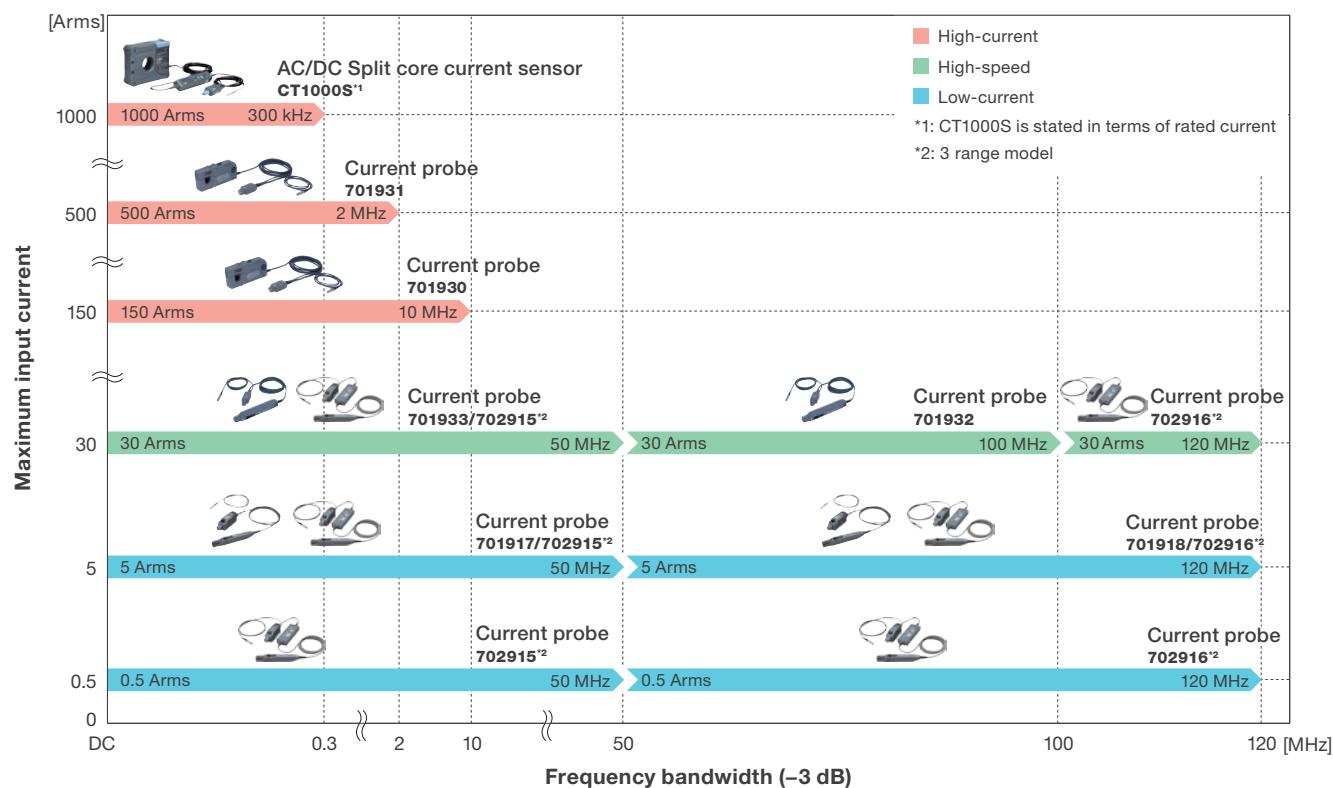


# Sensor

## Voltage probe



## Current probe/Current sensor



## Specifications (Main unit)

For the plug-in modules specifications, see the "Bulletin DL950E-02EN".

Signal Input Section	
Type	Plug-in input unit
Number of slots	8
Maximum number of input channels	
	32 channels (when 4-CH modules are used in all slots) 128 channels (when 16 CH temperature/voltage modules are used in all slots)
Memory size	Standard: 1 Gpoint (up to 500 Mpoints per channel) /M1 option: 4 Gpoints (up to 2 Gpoints per channel) /M2 option: 8 Gpoints (up to 4 Gpoints per channel)
Scope Mode Features	
Waveform Acquisition and Display	
Acquisition mode	Normal Envelope Averaging
	Normal waveform acquisition Holds peak values at the maximum sample rate, regardless of the time axis setting Average count: 2 to 65536 (2 <sup>16</sup> steps), Infinite (attenuation constant: 2 to 256, 2 <sup>8</sup> steps)
Record length	Standard model /M1 /M2
	10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M (32 CH), 50 M (16 CH), 100 M (8 CH), 250 M (4 CH), 500 M (2 CH) 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M (32 CH), 250 M (16 CH), 500 M (8 CH), 1 G (4 CH), 2 G (2 CH) 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M (32 CH), 500 M (16 CH), 1 G (8 CH), 2 G (4 CH), 4 G (2 CH)
Sample rate	Can be set up to the module's maximum sample rate for each channel (there are limitations based on the record length)
Selectable time scale range	100 ns/div to 1 s/div (1-2-5 steps), 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 10 s/div, 20 s/div, 30 s/div, 1 min/div to 6 min/div (1 min steps), 10 min/div, 12 min/div, 30 min/div, 1 h/div to 6 h/div (1 h steps), 8 h/div, 10 h/div, 12 h/div, 1 day/div to 5 day/div (1 day steps)
Action performed at the end of acquisition	Waveform data saving (simultaneous saving in binary, ASCII, and MATLAB formats) Image saving, measurement result saving, mail transmission, buzzer notification
Event recording	Records up to 100 events using the event input terminal
Zoom	Two windows
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group)
Maximum number of displayed traces	Up to 64 traces for each display group
Display interpolation	Off, Sine interpolation, linear interpolation, pulse interpolation
X-Y display	Select X and Y axes from analog input waveforms and Math waveforms, up to four traces in two windows
Accumulation	Waveform accumulation: Infinite, 2, 4, 8, 16, 32, 64, 128
History function	Maximum number of histories: 5000 Display mode: Single waveform display, all waveform display, average display
Dual capture	Data acquisition of the same waveform is possible at two different sample rates
Low-speed sampling	Maximum sample rate: 100 kS/s Selectable time scale range: 1 s/div to 5 day/div
High-speed sampling	Maximum sample rate: Module's maximum sample rate Selectable time scale range: 100 ns/div to 1 min/div Maximum record length: 50 M (M2)
SSD recording (ST1 or ST2)	Maximum sample rate: Depends on the number of used channels. 2 MS/s (when 1 CH is used), 200 kS/s (when 16 CH is used) maximum Maximum record length: 50 G (M2 8 CH)
Flash acquisition (ST2)	Maximum sample rate: Depends on the number of used channels. 20 MS/s (when 8 CH is used), 10 MS/s (when 16 CH is used) maximum Maximum record length: 20 G (M2 4 CH)
Vertical and Horizontal Control	
Channel on/off	CHn, CHn_m, RTMATHn, and MATHn can be turned on and off separately
Vertical axis zooming	×0.1 to ×100 (varies depending on the module type) By setting the scale using upper and lower limits
Vertical position setting	Waveforms can be moved in the range of ±5 div (not possible when top and bottom scale values are set).
Linear scaling	Can be set to Ax+B mode or P1-P2 mode (only for voltage, stress, and frequency)
Roll mode display	When the trigger mode is set to auto, single, or on-start, and the time axis setting is greater than or equal to 100 ms/div
Deskewing	±1 µs (modules with sample rates at 10 MS/s or faster)
Triggering Section	
Trigger mode	Auto, Auto Level, Normal, Single, Single (N), On-start

Selectable trigger level range	0 ±10 div
Manual trigger	Input through dedicated keys or communication commands
Simple trigger	Trigger source CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external, time, line
Trigger slope	Rising, falling, both edges (rising, falling only for logic)
Clock trigger	Date (year/month/day), time (hour/minute/second), time interval (10 seconds to 24 hours)
Enhanced trigger	Trigger source CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external
Trigger type	A→B (N), A Delay B, Edge on A, AND, OR, Period, Pulse Width, WaveWindow
Analysis	
Cursors	T-Y waveforms: Horizontal / Vertical / H&V / Marker / Degree X-Y waveforms: Horizontal / Vertical / H&V / Marker FFT waveforms: Marker / Peak / Peak List
Automated measurement of waveform parameters	
Measured parameters	Analog waveform, Math PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, AvgPeriod, Int1TY, Int2TY, Int1XY, Int2XY, Delay
Logic waveform	Freq, Period, Pulse, Duty, Avg.Freq, Delay
Statistical processing	Statistical items Max, Min, Avg, Sdv, Cnt
Maximum number of cycles	64000
Maximum measurement range	4 Gpoints (memory recording), 100 Mpoints (internal storage)
Continuous statistical processing	Statistical processing is performed while waveforms are acquired
Cyclic statistical processing	Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters
History statistical processing	Automatically measures the waveform parameters on the data of each history waveform and performs statistical processing on the parameters
Waveform computation	Operators Basic arithmetic with coefficients, binarization, shift
Number of computations	Up to 8
Computation length	Up to 2 Mpoints (when one waveform is used), 250 kpoints (when eight waveforms are used)
User-defined math function (/G02 option)	Operators Equations can be created using the following operators. ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLB1, MEAN
Set the average	Simple average, exponential average, cycle average, peak computation
FFT	Waveform to be computed CHn, CHnm, RTMATHn, MATHn
Number of windows	2
Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
Computation range	From the specified computation time start point until the specified number of points have been computed
Math points	1 k / 2 k / 5 k / 10 k / 20 k / 50 k / 100 k
Time window	Hanning, Hamming, FlatTop, Rectangle, Exponential (/G02 option)
Average setting (/G02 option)	Domain: Time axis, frequency axis Type: Simple average, exponential average, peak computation
GO/NO-GO determination	A selected operation can be performed according to the determination condition on the acquired waveform.
Zone determination	Number of determination zones: Up to 6 Number of source waveforms: Up to 16 Combinations: AND, OR
Parameter determination	Number of determination parameters: Up to 16 Combinations: AND, OR
Operation after determination	Screen capture data saving, waveform data saving, buzzer notification, mail transmission
Zooming and searching	You can search for and then expand and display a portion of the displayed waveform.
Type	Edge: Searches by counting the number of rising and falling edges Logic pattern: Searches by counting the logic pattern Event: Searches for an event number Time: Searches for a date and time
History search	Searches through history waveforms for specified conditions
Zone search	Number of determination zones: Up to 4 Combinations: AND, OR
Parameter search	Number of determination parameters: Up to 4 Combinations: AND, OR

Recorder Mode Features	
<b>Waveform Acquisition and Display</b>	
Record conditions	
Preset time recording	Records data for the specified time period from the start point
Continuous recording	Records data for the specified time period before stopping
Trigger recording	Records data based on trigger position setting
Acquisition mode	
Memory recording	Records waveforms to internal memory
Saving during and at the end of memory recording	Records to internal memory and then saves waveform data or screen capture data to files
SSD recording (/ST1 or /ST2)	Records waveforms to internal SSD storage
Flash acquisition (/ST2)	Records waveforms in the storage for flash acquisition
Acquisition mode	
Normal	Normal waveform acquisition
Envelope	Holds peak values at the maximum sample rate, regardless of the time axis setting
Recording time	1 s to 50 days
Sampling interval	100 ns to 200 ms (1-2-5 series)
Action performed at the end of recording	Waveform data saving (binary, ASCII, and MATLAB formats) Screen capture data saving, measurement results saving, buzzer notification, mail transmission
SSD recording (/ST1 or /ST2)	
Minimum sampling interval	Depends on the number of used channels. 500 ns (when 1 CH is used), 5 $\mu$ s (when 16 CH is used) minimum
Maximum number of recorded points	20 Gpoints, 50 Gpoints (M1, /M2) (there are limitations based on the number of used channels)
Flash acquisition (/ST2)	
Minimum sampling interval	Depends on the number of used channels. 100 ns (when 16 CH is used), 200 ns (when 32 CH is used) minimum
Maximum number of recorded points	10 Gpoints, 20 Gpoints (M1, /M2) (there are limitations based on the number of used channels)
Event recording	Records up to 100 events using the event input terminal
Display time range	10 $\mu$ s to 10 s (1-2-5 steps), 20 s, 30 s, 40 s, 50 s, 60 s, 100 s, 200 s, 300 s, 10 min to 60 min (10 min steps), 100 min, 2 hour, 5 hour, 10 hour to 60 hour (10 hour steps), 80 hour, 100 hour, 5 day, 10 day, 20 day, 30 day, 40 day, 50 day
Zoom	One window
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group) of TV display
Maximum number of displayed traces	Up to 64 traces for each display group
X-Y display	Number of windows: 2 Number of X-Y traces: Up to eight traces (up to four traces/window) Select the X and Y axes from CHn, CHn_m, RTMATHn, MATHn.
<b>Vertical and Horizontal Control</b>	
Channel on/off	CHn, CHn_m, RTMATHn, and MATHn can be turned on and off separately.
Vertical axis zooming	By setting the scale using upper and lower limits
Linear scaling	Can be set to Ax+B mode or P1-P2 mode (only for voltage, stress, and frequency)
Deskewing	$\pm 1 \mu$ s (modules with sample rates at 10 MS/s or faster)
<b>Triggering Section</b>	
Selectable trigger level range	0 $\pm$ measurement range
Manual trigger	Using a dedicated key
Trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external trigger, time
Trigger type	Edge, Time, OR, AND
<b>Analysis</b>	
Cursors	T-Y waveforms: Horizontal / Vertical / H&V / Marker / Degree X-Y waveforms: Horizontal / Vertical / H&V / Marker FFT waveforms: Marker / Peak / Peak List
Automated measurement of waveform parameters	
Measured parameters	
Analog waveform, Math	PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over, Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, Avg.Period, Int1TY, Int2TY, Int1XY, Int2XY, Delay
Logic waveform	Freq, Period, Pulse, Duty, Avg.Freq, Delay
Statistical processing	
Statistical items	Max, Min, Avg, Sdv, Cnt
Maximum number of cycles	64000
Maximum measurement range	4 Gpoints (memory recording), 100 Mpoints (SSD recording)
Cyclic statistical processing	Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters

Waveform computation	
Operators	Basic arithmetic with coefficients, binarization, shift
Number of computations	Up to 8
Computation length	Up to 2 Mpoints (when one waveform is used), 250 kpoints (when eight waveforms are used)
User-defined math function (/G02 option)	
Operators	Equations can be created using the following operators ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, INTG, BIN, P2, P3, F1, F2, FV, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLB1, MEAN
Set the average	None
FFT	
Waveform to be computed	CHn, MATHn
Number of windows	2
Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
Computation range	From the specified computation time start point until the specified number of points have been computed
Math points	1 k / 2 k / 5 k / 10 k / 20 k / 50 k / 100 k
Time window	Hanning, Hamming, FlatTop, Rectangle, Exponential (/G02 option)
Set the average	None
Zooming and searching	
You can search for and then expand and display a portion of the displayed waveform	
Type	Edge: Searches by counting the number of rising and falling edges Logic pattern: Searches by counting the logic pattern Event: The instrument searches for an event number Time: The instrument searches for a date and time
<b>Real Time Math (/G03, /G05, /MT1)</b>	
Math expression	Real time math using hardware
Max. number of math channels	16 (separate from the input channels)
Computation result storage format	Single-precision floating-point (32 bit)
<b>Real time math function</b>	
Math rate	Max. math rate: 10 MS/s or 1 MS/s for polynomials
Math type	Basic arithmetic with coefficients, Angle math, Quartic polynomial, Coefficient multiplied by addition or subtraction of sources, Logic signal/analog waveform conversion, Differentiation, Integration, Common logarithm, Square root, Frequency, Period, Edge count, Demodulation of PWM signal, Torque, Rms value, Effective power, Effective power integration, Cosine, Sine, Arc tangent, Angle of rotation, Electrical angle, Knocking filter (only when the /VCE option is installed), Resolver, 3 phase resolver, IIR filter, CAN ID (only when the /VCE option is installed), Bin, Peak, Edge sampling, Phase difference, Clark transform (only when the /MT1 option is installed)
Math source waveforms	All input channels including sub channels. (there are limitations based on the operator) Math results can be specified as sources of another channel. However, you can only specify math results of channels whose numbers are smaller than the channel that you are specifying sources for.
Math delay	A uniform delay for each math operation, regardless of the number of math channels
Filter on math results	IIR low-pass filter all math results Full, cutoff frequencies 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, 62.5 Hz
Vertical scale	Set based on the specified top and bottom scale values, simultaneous use of zooming using the scale knob and moving using the position knob
<b>Digital filter</b>	
Digital filter	Digital filter for input channels. Math can be performed on up to 16 channels at the same time
Target input modules	720212, 720211, 701250, 701255, 720250, 701251, 720268, 701261, 701262, 701265, 720266, 701275, 701270, 701271
Filter types	Mean (moving average), Gauss, Sharp, IIR, IIR-Lowpass
<b>Power Math (/G05, /MT1), Motor dq analysis (/MT1)</b>	
Math expression	Real time math using hardware
Math source channels	Voltage input channels excluding the 720221
Max. math rate	10 MS/s
Min. analysis period	0.1ms (10 kHz)
Math result output channels	Power analysis math: Real time math RTMATH13, RTMATH14 Motor dq analysis function: Real time math RTMATH13, RTMATH14 Harmonic analysis math: Real time math RTMATH15, RTMATH16
Computed result	Single-precision floating-point (32 bit)
Max. number of analyzable systems	Up to two three-phase systems can be computed simultaneously
Max. number of simultaneous math parameters	118 when one system is measured 58 $\times$ 2 systems when power math function two systems are measured 62 $\times$ 2 systems when motor dq analysis function two systems are measured
Supported wiring systems	Single-phase two-wire (1P2W), single-phase three-wire (1P3W) (only when the Power math or Harmonic analysis is activated), three-phase three-wire (3P3W), three-phase three-wire system that uses a three-voltage three-current method (3V3A, 3V3AR, 3V3AS), three-phase four-wire system (3P4W)

**Delta math function**

Three-phase three-wire (3P3W) → three-phase three-wire system that uses a three-voltage three-current method (3V3A)  
 Three-phase four-wire system (3P4W) → three-phase three-wire (3V3A) (star → delta)  
 Three-phase three-wire (3V3A) → three-phase four-wire system (3P4W) (delta → star)  
 Three-phase three-wire system that uses a three-voltage three-current method (3P3W) → three-phase four-wire system (3P4W) (delta → star)  
 Three-phase three-wire system that uses a three-voltage three-current method (3V3AR) → three-phase four-wire system (3P4W) (delta → star)  
 Three-phase three-wire system that uses a three-voltage three-current method (3V3AS) → three-phase four-wire system (3P4W) (delta → star)

**Supported Position Sensors**

Incremental Encoder, Absolute Encoder, Resolver, 3-Phase Resolver, 1 Pulse

**Power math items (only when the /G05 or /MT1 option is installed)**

Rms voltage and current of each phase, Voltage and current simple average of each phase (DC), AC voltage and current components of each phase (AC), Active power, Apparent power, Reactive power, Power factor, Current phase difference, Voltage and current frequencies, Maximum voltage and current, minimum voltage and current, Maximum power, minimum power, Integrated watt-hour, integrated watt-hour of each polarity (positive and negative), Integrated ampere-hour, integrated ampere-hour of each polarity (positive and negative), Apparent energy, Reactive energy, Impedance of the load circuit, Series resistance of the load circuit, Series reactance of the load circuit, Parallel resistance of the load circuit, Parallel reactance of the load circuit, Three-phase voltage unbalance factor, Three-phase current unbalance factor, Motor output math, Power efficiency

**Motor dq analysis function items (only when the /MT1 option is installed)**

Rms voltage and current of each phase, Active power, Apparent power, Reactive power, Power factor, Current phase difference, Maximum power, Minimum power, integrated watt-hour of each polarity (positive and negative), Integrated ampere-hour, integrated ampere-hour of each polarity (positive and negative), Apparent energy, Reactive energy, Maximum voltage and current, minimum voltage and current, Rotation frequency, Voltage and current fundamental analysis component, Voltage and current fundamental component phase difference, dq-axis current and voltage, dq-axis inductance, salient ratio, dq-axis armature flux linkage, Torque, Motor electric power, Motor power, DC voltage and current, DC power, DC integrated watt-hour, DC ampere-hour, Efficiency, Integration time, Electric angle frequency

**Rms math system**

Select true rms value or rectified mean value calibrated to the rms value

**Math sync mode**

Edge	Select a signal. Computed using zero-crossings.
Auto Timer	Specify the time. Computed at specified time intervals. (only when the /G05 option is installed)
AC	Select a signal. Computed using zero-crossings. Signal stop determined by a stop prediction function.
AC+DC	Select a signal. Computed using zero-crossings. Signal stop determined by a stop prediction function. Switches to Auto Timer after stopping.

**Channel selection for edge**

Select a single channel: voltage, current, or rotation period.

**Sync channel filter**

If sync mode is set to Edge, low-pass filter can be selected.  
 Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.

**dq voltage and current waveform display**

id, iq, vd, vq, voltage and current waveforms (output to RTMATH channel after dq conversion)

**Harmonic analysis**

Max. number of analyzable systems	1
Max. number of analyzable frequencies	Fundamental wave 1 kHz
FFT points	4096
Math mode	Rms analysis mode, power analysis mode
Math items	Rms analysis mode: Rms percentage content of the 1st to 40th harmonic, Phase angles of the 1st to 40th harmonic, Total rms value, Distortion factor (IEC), Distortion factor (CSA)
Power analysis mode	Active powers from the 1st to the 35th harmonic, Active power percentage content from the 1st to the 35th harmonic, Phase angles of the 1st to 35th harmonic, Total active powers, Total reactive powers, Total apparent powers, Power factor, 1st harmonic rms voltage, 1st harmonic rms current, 1st harmonic voltage phase angle, 1st harmonic current phase angle

**Sync channel**

Rms analysis mode: Analysis source channel  
 Power analysis mode: Select one channel from voltage and current.

**Sync channel filter**

Low-pass filter can be selected  
 Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.

**Time Axis**

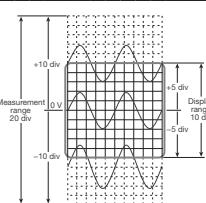
Time axis accuracy	±4.6 ppm
External clock input	Clock input through the external clock input terminal

**Display**

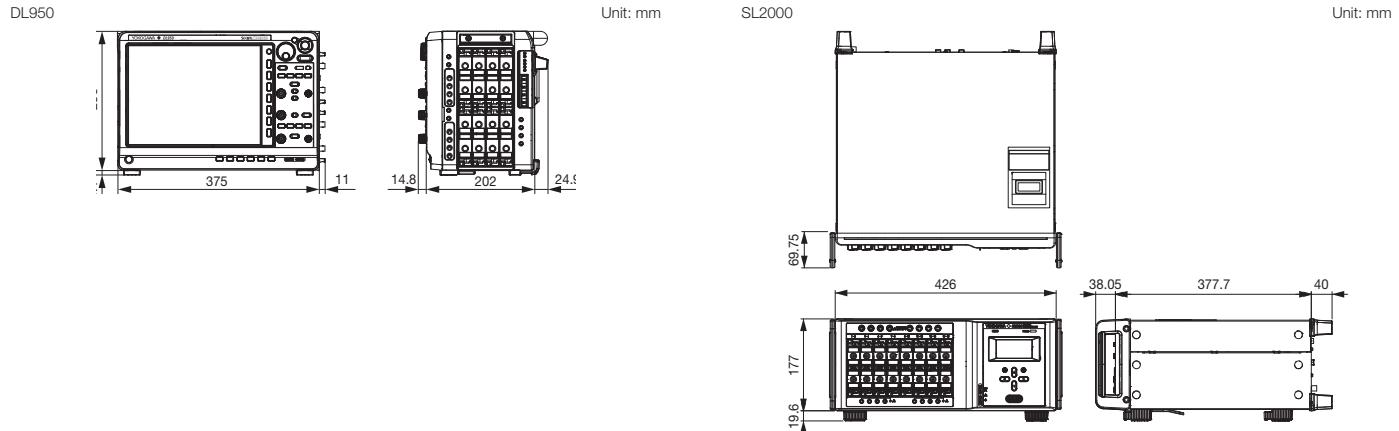
Display	12.1-inch color TFT LCD (capacitive touch panel)
Display format	T-Y, X-Y, FFT, harmonics (/G05)
Display resolution	1024×768 (XGA)
Resolution of the waveform display	801×656 (normal), 1001×656 (wide)

<b>Defective pixels</b>	3 ppm or less of the total number of pixels including RGB
<b>Saving Data</b>	
<b>Saving Data</b>	Measured data, analysis results, settings, screen capture
Types of saved data	Binary (.WDF), MATLAB (.MAT), text (.CSV)
Measured data format	Maximum file size (MAT, CSV format): 2 GByte
Data storage device	Internal storage, SD memory card, USB storage, network drive
<b>Saving Screen Captures</b>	
Screen capture data format	PNG, JPEG, BMP
Screen capture data color	Monochrome, color, color (reverse), grayscale
Data storage device	Internal storage, SD memory card, USB storage, network drive
<b>PC Data Streaming</b>	
Connection type	USB, Ethernet, 10 G Ethernet (/C60)
Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1 CH is used), 200 kS/s (when 16 channels are used) maximum (USB, Ethernet) 20 MS/s (when 8 channels are used), 10 MS/s (when 16 channels are used) (10 G Ethernet)
<b>Multi-Unit Synchronization (/C50)</b>	
Connector type	SFP
Ports	4 (up to four sub units can be connected to a main unit)
Synchronization accuracy	±(30 ns + 1 sample) (typical value)
Function	Start and stop from the main unit, combination trigger across units
Maximum cable length	20 m
<b>Storage</b>	
<b>Internal storage (/ST1 or /ST2 option)</b>	
Number of drives	1
Media type	SSD
Available space	512 GB
<b>Storage for flash acquisition (/ST2)</b>	
Available space	Acquisition data 160 GB
Memory backup	Automatically saves the acquisition memory data at power-off by the front panel switch
<b>SD memory card</b>	
Number of slots	1
Compatible cards	SD, SDHC, and SDXC memory cards
<b>USB storage</b>	
Compatible USB storage devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1
	Mass storage devices that comply with USB
Available space	8 TB max. Partition format: MBR, GPT; format type: FAT16/FAT32/exFAT
<b>USB Ports for Peripherals</b>	
Connector type	USB type A (receptacle)
Electrical and mechanical	USB Rev. 2.0 compliant
<b>Supported transfer modes</b>	
HS (High Speed: 480 Mbps), FS (Full Speed: 12 Mbps), LS (Low Speed: 1.5 Mbps)	
<b>Compatible devices</b>	
Mass storage devices that comply with USB Mass Storage Class Ver. 1.1	
104 or 109 keyboards that comply with USB HID Class Ver. 1.1	
Mouse devices that comply with USB HID Class Ver. 1.1	
HP Inkjet printers compatible with USB Printer Class Ver. 1.0, BrotherPocketJET printers	
Number of ports	2
Power supply	5 V, 500 mA (for each port)
<b>External Printer Output</b>	
Supported models	Brother Pocket JET printers, 300 dpi models HP inkjet printers, single function models For details on models, see the catalog or website
Output format	Screen hard copy, monochrome or color (color available only with HP printers)
<b>Auxiliary I/O Section</b>	
<b>External Trigger Input Terminal</b>	
Connector type	BNC
Input level	TTL (0 to 5 V)
Minimum pulse width	100 ns
Detected edge	Rising or falling
<b>Trigger Output Terminal</b>	
Connector type	BNC
Output level	5 V CMOS
Output delay time	(1.8 µs to 4.5 µs) + 1 sample (typical value) Applies to 1 MS/s or faster modules. Depends on the installed module

Output format	
Normal format	
Logic: Falls when a trigger occurs and rises when a signal acquisition is completed	
Output hold time: 100 ns or more	
Pulse format	
Logic: Transmits a pulse when a trigger occurs	
Pulse width: 1 ms, 50 ms, 100 ms, 500 ms	
<b>External Clock Input Terminal</b>	
Connector type	BNC
Input level	TTL (0 to 5 V)
Maximum input frequency	9.5 MHz, 100 kHz (for envelope)
Minimum pulse width	50 ns
Detected edge	Rising
<b>Video signal output</b>	
Connector type	D-sub 15 pin, receptacle
Output format	Analog RGB
Output resolution	XGA-compliant output, 1024 × 768 dots Approx. 60-Hz Vsync (66 MHz dot clock frequency)
<b>GO/NOGO Output</b>	
Connector type	Screwless terminal block
Output level	5 V CMOS
<b>External Start/Stop Input</b>	
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input
<b>Event Input</b>	
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input
<b>Sample clock output</b>	
Connector type	Screwless terminal block
Output level	5 V CMOS
Output operation	Outputs a clock signal at the specify frequency
Frequency range	5 Hz to 200 kHz (1-2-5 steps)
<b>COMP Output (Probe Compensation Signal Output Terminal)</b>	
Output signal frequency	1 kHz±1%
Output amplitude	1 Vp-p±10%
<b>Probe power (/P4 or /P8 option)</b>	
Output terminals	4 (/P4), 8 (/P8)
Output power	±12 V
Output current	Up to a total of 2.4 A (/P4), up to a total of 4.8 A (/P8)
<b>GPS Interface (/C35 option)</b>	
Input connector	9-pin Mini DIN
Compatible GPS unit	720940 (optional accessory)
Function	Instrument clock synchronization, Sample clock synchronization, GPS data acquisition (latitude, longitude, altitude, velocity, movement direction, GPS position information)
Synchronization accuracy*	±200 ns (typical value when locked to GPS signal)*
*The figure is based on results obtained when the GPS unit is installed in a location with good line of sight to GPS satellites. The accuracy may not be attained depending on the measurement location, the location of satellites when the measurement is taken, the weather, and influence caused by obstruction.	
<b>IRIG Interface (/C35 option)</b>	
Input connector	BNC
Number of input connectors	1
Compatible IRIG signals	A006, B006, A136, B126
Input impedance	50 Ω/5 kΩ switchable
Maximum input voltage	±8 V
Used for	Instrument clock synchronization Sample clock synchronization
Clock sync range	±60 ppm
Synchronization accuracy	No drift from the input signal
<b>Computer Interface</b>	
<b>USB-PC Connection</b>	
Connector type	USB type B (receptacle)
Electrical and mechanical specifications	USB Rev. 3.0 compliant
Supported transfer modes	FS (Full Speed) mode (12 Mbps), HS (High Speed) mode (480 Mbps), SS (Super Speed) mode (5 Gbps)
Number of ports	1
Supported protocols	Functions as a device that conforms to one of the following two protocols.
USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0)* Communication commands can be used through USB.	
*A separate driver is required.	
Mass Storage Class Ver.1.1 Only reading is possible from the instrument's internal storage through PC access. (Operations, such as formatting, are not possible.)	

PC system requirements	Windows8.1, Windows10, Windows11
<b>Ethernet</b>	
Connector type	RJ-45 modular jack
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (1000BASE-T/100BASE-TX/10BASE-T)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNTP client, SMTP client, FTP client, FTP server, Web server, LPR, VXI-11, HISLIP, Socket PTP slave, PTP master (/C40 option)
<b>Time synchronization feature</b>	
Sync source	Supports IEEE1588-2008 (PTP v2), Supports PTP packets of Layer3 (UDP/IPv4) and Layer2 (Ethernet), Slave feature only (without the /C40 option), Slave and master features (with the /C40 option), Supports Ordinary Clock, Supports E2E delay correction, Supports 2-step Sync messages
Sync targets	Instrument clock, sample clock
Synchronization accuracy	±150 ns (typical value) when 1000BASE-T is used and an Ethernet switch is not used
Master sync clock (/C40 option)	Internal clock, GPS (/C35 option)
<b>10 G Ethernet (/C60)</b>	
Connector type	SFP+
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (10GBASE-R)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNTP client, SMTP client, FTP client, FTP server, Web server, Socket, VXI-11, HISLIP
<b>General Specifications</b>	
<b>Standard operating conditions</b>	
Ambient temperature	23±5°C
Ambient humidity	20 to 80%RH
Supply voltage and frequency errors	Within ±1% of rating
After a 30 minute warm-up and after calibration	
<b>Recommended calibration period</b>	1 year
<b>Warm-up time</b>	At least 30 minutes
<b>Operating environment</b>	Temperature: 5°C to 40°C Humidity: 20 to 85%RH (no condensation) Altitude: 2000 m or less
<b>Storage environment</b>	Temperature: -20°C to 60°C Humidity: 20 to 85%RH (no condensation)
<b>Power supply</b>	
Rated supply voltage	100 to 120 VAC, 220 to 240 VAC (auto switching)
Permitted supply voltage range	90 to 132 VAC, 198 to 264 VAC
Rated supply frequency range	48 Hz to 63 Hz
Maximum power consumption	280 VA
Withstand voltage	1500 VAC for 1 minute between the power supply and case
Insulation resistance	10 MΩ or higher at 500 VDC between the power supply and case
<b>DL950</b>	
Installation orientation	Vertical, horizontal, tilted
External dimensions	Approx. 375 mm (W) × 259 mm (H) × 202 mm (D), excluding the handle and protrusions
Weight	Approx. 7.5 kg (main unit only, no options)
<b>SL2000</b>	
Installation orientation	Vertical, tilted
External dimensions	Approx. 426 mm (W) × 177 mm (H) × 380 mm (D), excluding the handle and protrusions
Weight	Approx. 8.5 kg (main unit only, no options)
<b>Measurement Range and Display Range</b>	
The measurement range of the ScopeCorder is ±10 divisions (20 divisions of absolute width (span)) around 0 V. The display range of the screen is ±5 divisions (10 divisions of span). The following functions can be used to move the displayed waveform and display the waveform outside the display range by expanding/reducing the displayed waveform.	
<ul style="list-style-type: none"> <li>Move the vertical position.</li> <li>Set an offset voltage.</li> <li>Zoom in or out of the vertical axis (expand/reduce).</li> </ul>	
	

## Outline Drawing



## Plug-in module model numbers

Model	Description
720212	High-speed 200 MS/s 14 Bit Isolation Module
720211	High-speed 100 MS/s 12 Bit Isolation Module
720250	High-speed 10 MS/s 12 Bit Isolation Module
701251	High-speed 1 MS/s 16 Bit Isolation Module
720256	4 CH 10 MS/s 16 Bit Isolation Module
720254	4 CH 1 MS/s 16 Bit Isolation Module
701255	High-speed 10 MS/s 12 Bit non-Isolation Module
720268	High-Voltage 1 MS/s, 16 Bit Isolation Module (with AAF, RMS)
720220	Voltage Input Module (16 CH)
701261	Universal Module
701262	Universal Module (with Anti-Aliasing Filter)
701265	Temperature/High-Precision Voltage Module
720266	Temperature/High-Precision Voltage Isolation Module (Low Noise)
720221	16 CH Temperature/Voltage Input Module
701953-L1	16 CH Scanner Box (provided with 1 m cable)
701953-L3	16 CH Scanner Box (provided with 3 m cable)
701270	Strain Module (NDIS)
701271	Strain Module (DSUB, Shunt-CAL)
701275	Acceleration/Voltage Module (with Anti-Aliasing Filter)
720281	Frequency Module
720230	Logic Input Module
720245	CAN FD/LIN Monitor Module
720243	SENT Monitor Module

\*Probes are not included with any modules.

\*The External Scanner Box (model 701953) is required to use the the 720221 module.

\*Firmware update may be required when using these modules.

\*The specifications of these modules are expressed differently in the case of the SL1000. See the SL1000 user's manual.

This is a Class A instrument based on Emission standards EN61326-1, 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.

See previous page for detail about probes, cables, and converters.

Probes, cables, and converters<sup>\*8</sup>

Model	Product	Description <sup>*1</sup>
701947	100:1 Probe	1000 V (DC+ACpeak) CAT II, 1.5 m
702902	10:1 Probe	Operating temp. range: -40 to 85°C, 2.5 m
700929	10:1 Probe	1000 V (DC+ACpeak) CAT II, 1.5 m
701901	1:1 Safety BNC adapter lead	1000 Vrms CAT II
701904	1:1 Safety Adapter Lead (in combination with the following)	1000 Vrms CAT II, 600 Vrms CAT III
758928	Pinchers tip (Hook type)	1000 Vrms CAT III, 1 set each of red and black
701954	Large alligator-clip (Dolphin type)	1000 Vrms CAT III, 1 set each of red and black
758929	Alligator clip adaptor set	1000 Vrms CAT II, 1 set each of red and black
758922	Alligator clip adaptor set	300 Vrms CAT II, 1 set each of red and black
758921	Fork terminal adapter set	1000 Vrms CAT II, 1 set each of red and black
701940	Passive probe <sup>*2</sup>	Non-isolated 600 Vpk (701255) (10:1)
366926	1:1 BNC-alligator cable	Non-isolated 42 V or less, 1 m
366961	1:1 Banana-alligator cable	Non-isolated 42 V or less, 1.2 m
702915	Current probe <sup>*3,*4</sup>	0.5, 5, 30 Arms, DC to 50 MHz
702916	Current probe <sup>*3,*4</sup>	0.5, 5, 30 Arms, DC to 120 MHz
701917	Current probe <sup>*3,*4</sup>	5 Arms, DC to 50 MHz
701918	Current probe <sup>*3,*4</sup>	5 Arms, DC to 120 MHz
701932	Current probe <sup>*3,*4</sup>	30 Arms, DC to 100 MHz
701933	Current probe <sup>*3,*4</sup>	30 Arms, DC to 50 MHz
701930	Current probe <sup>*3,*4</sup>	150 Arms, DC to 10 MHz
701931	Current probe <sup>*3,*4</sup>	500 Arms, DC to 2 MHz
720930	Clamp-on probe	AC 50 Arms, 40 Hz to 3.5 kHz
720931	Clamp-on probe	AC 200 Arms, 40 Hz to 3.5 kHz
CT1000S	AC/DC Split core current sensor <sup>*3,*4</sup>	1000 Arms, DC to 300 kHz
701934	Probe power supply	External probe power supply (4 outputs)
701977	Differential probe <sup>*3,*4</sup>	7000 Vpeak, 5000 Vrms (For 701255)
701978	Differential probe <sup>*3,*4</sup>	1500 Vpeak, 1000 Vrms (For 701255)
701905	Conversion cable	for Differential probe
701955	Bridge head (NDIS, 120 Ω)	With 5 m cable
701956	Bridge head (NDIS, 350 Ω)	With 5 m cable
701957	Bridge head (DSUB, 120 Ω)	Shunt-CAL with 5 m cable
701958	Bridge head (DSUB, 350 Ω)	Shunt-CAL with 5 m cable
758924	Safety BNC-banana adapter	500 Vrms CAT II
702911	Logic probe <sup>*5</sup>	8 bit, 1 m, non-Isolated, TTL level/Contact Input
702912	Logic probe <sup>*5</sup>	8 bit, 3 m, non-Isolated, TTL level/Contact Input
700986	High-speed logic probe <sup>*5</sup>	8 bit, non-Isolated, response speed: 1 μs (typ.)
700987	Isolation logic probe <sup>*6</sup>	8 bit, each channel isolated
758917	Measurement lead set <sup>*7</sup>	0.75 m, Stackable type (2 per set) Separate alligator clips are required.
758933	Measurement lead set <sup>*7</sup>	1000 V/19 A/1 m length Separate alligator clips are required.
701902	Safety BNC-BNC cable (1 m)	1000 Vrms CAT II (BNC-BNC)
701903	Safety BNC-BNC cable (2 m)	1000 Vrms CAT II (BNC-BNC)
701948	Plug-on clip	For 700929 and 701947
701906	Long test clip	For 701977, 701978 and 701901
720941	Optical Transceiver Module	For multi-unit connection
720942	Optical Fiber Cord	For multi-unit connection, 3 m
701972	Soft carrying case	For DL950
720940	GPS unit	For DL950, SL2000 and DL350
751542-E4	Rack mounting kit	For an EIA-compliant Single-housing Rack
751542-J4	Rack mounting kit	For an JIS-compliant Single-housing Rack

\*1: Actual allowable voltage is the lower of the voltages specified for the main unit and cable.

\*2: 30 Vrms is safe when using the 701940 with an isolated type BNC input. \*3: The number of current probes that can be powered from the main unit's power supply is limited. \*4: Either the probe power option of the main unit or the probe power supply (701934) is required. \*5: Includes one of each of the B9879PX and B9879KX connection leads. \*6: Additionally, 758917 and either the 758922 or 758929 are required for measurement. \*7: Alligator clips are required. \*8: Refer to the bulletin and user's manual of each product to confirm the compatibility with the main unit.

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.

## DL950 Model and suffix code

Model	Suffix codes	Description
DL950		ScopeCorder, 1 G Points memory <sup>1</sup>
Power cord	-D	UL/CSA standard and PSE compliant
	-F	VDE/Korean standard
	-R	Australian standard
	-Q	British standard
	-H	Chinese standard
	-N	Brazilian standard
	-T	Taiwanese standard
	-B	Indian standard
	-U	IEC Plug Type B
Language	-HJ	Japanese menu and panel
	-HE	English menu and panel
	-HC	Chinese menu and panel
	-HK	Korean menu and panel
	-HG	German menu and panel
	-HF	French menu and panel
	-HL	Italian menu and panel
	-HS	Spanish menu and panel
	-HR	Russian menu and panel
Option	/M1 <sup>2</sup>	Memory expansion to 4 G Points <sup>7</sup>
	/M2 <sup>2</sup>	Memory expansion to 8 G Points <sup>8</sup>
	/ST1 <sup>3</sup>	Internal storage (512 GB)
	/ST2 <sup>3</sup>	Internal storage (512 GB) + Flash Acquisition function
	/C35	IRIG and GPS interface
	/C40	IEEE1588 Master function
	/C50	Multi-unit synchronization interface
	/C60	10 Gbps Ethernet interface
	/G02	User-defined math function
	/G03 <sup>4</sup>	Real time math function
	/G05 <sup>4</sup>	Power math function (including Real time math function)
	/MT1 <sup>4</sup>	Motor dq analysis function (including Power math function)
	/P4 <sup>5</sup>	Four probe power outputs
	/P8 <sup>5</sup>	Eight probe power outputs
	/VCE	Vehicle edition

### Standard Main Unit Accessories

Power cord, front cover, panel sheet, 8 slot cover panels, soft case, user's manuals<sup>6</sup>

<sup>1</sup>: The main unit requires plug-in module (s). Max. 500 M Points/CH. <sup>2</sup>,<sup>3</sup>,<sup>4</sup>,<sup>5</sup>: Only one of these can be selected. <sup>6</sup>: The Start Guide is provided as a printed document. <sup>7</sup>: Max. 2 G Points/CH <sup>8</sup>: Max. 4 G Points/CH

Binary files saved by DL950 cannot be opened by Xviewer. Please use IS8000.

## Additional option license for DL950\*

Model	Suffix code	Description
709831	-C40	IEEE1588 Master function
	-G02	User-defined math function
	-G05	/G03 -> /G05 (Add power math function) /G03 needs to be already installed on the DL950.
	-MT1	/G05->/MT1 (Add motor dq analysis function) /G05 needs to be already installed on the DL950.
	-VCE	Vehicle edition

\*Separately sold license product (customer-installable).

## SL2000 Model and suffix code

Model	Suffix codes	Description
SL2000		1 G Points memory <sup>1</sup> High-Speed Data Acquisition Unit, 1 G Point memory <sup>1</sup>
Power cord	-D	UL/CSA standard and PSE compliant
	-F	VDE/Korean standard
	-R	Australian standard
	-Q	British standard
	-H	Chinese standard
	-N	Brazilian standard
	-T	Taiwanese standard
	-B	Indian standard
	-U	IEC Plug Type B
Language	-HJ	Japanese menu
	-HE	English menu
	-HC	Chinese menu
	-HK	Korean menu
	-HG	German menu
	-HF	French menu
	-HL	Italian menu
	-HS	Spanish menu
	-HR	Russian menu
Option	/M1 <sup>2</sup>	Memory expansion to 4 G Points <sup>7</sup>
	/M2 <sup>2</sup>	Memory expansion to 8 G Points <sup>8</sup>
	/ST1 <sup>3</sup>	Internal storage (512 GB)
	/ST2 <sup>3</sup>	Internal storage (512 GB) + Flash Acquisition function
	/C35	IRIG and GPS interface
	/C40	IEEE1588 Master function
	/C50	Multi-unit synchronization interface
	/C60	10 Gbps Ethernet interface
	/G02	User-defined math function
	/G03 <sup>4</sup>	Real time math function
	/G05 <sup>4</sup>	Power math function (including Real time math function)
	/MT1 <sup>4</sup>	Motor dq analysis function (including Power math function)
	/P4 <sup>5</sup>	Four probe power outputs
	/P8 <sup>5</sup>	Eight probe power outputs
	/VCE	Vehicle edition
	/SN	Without Software

### Standard Main Unit Accessories

Power cord, front cover, panel sheet, 8 slot cover panels, soft case, user's manuals<sup>6</sup>

<sup>1</sup>: The main unit requires plug-in module (s). Max. 500 M Points/CH. Includes one license of IS8002. <sup>2</sup>,<sup>3</sup>,<sup>4</sup>,<sup>5</sup>: Only one of these can be selected. <sup>6</sup>: The Start Guide is provided as a printed document. <sup>7</sup>: Max. 2 G Points/CH <sup>8</sup>: Max. 4 G Points/CH

## Additional option license for SL2000\*

Model	Suffix code	Description
709833	-C40	IEEE1588 Master function
	-G02	User-defined math function
	-G05	/G03 -> /G05 (Add power math function) /G03 needs to be already installed on the DL950.
	-MT1	/G05->/MT1 (Add motor dq analysis function) /G05 needs to be already installed on the DL950.
	-VCE	Vehicle edition

\*Separately sold license product (customer-installable).

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\*Any company's names and product names mentioned in this document are trade names, trademarks or registered trademarks of their respective companies.

User's manuals: Start guide (booklet), function/operation, communication manuals (electric file)

### Yokogawa's Approach to Preserving the Global Environment

- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendly Product Design Guidelines and Product Design Assessment Criteria.

### NOTICE

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

# YOKOGAWA



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YMI-N-MI-M-E03

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