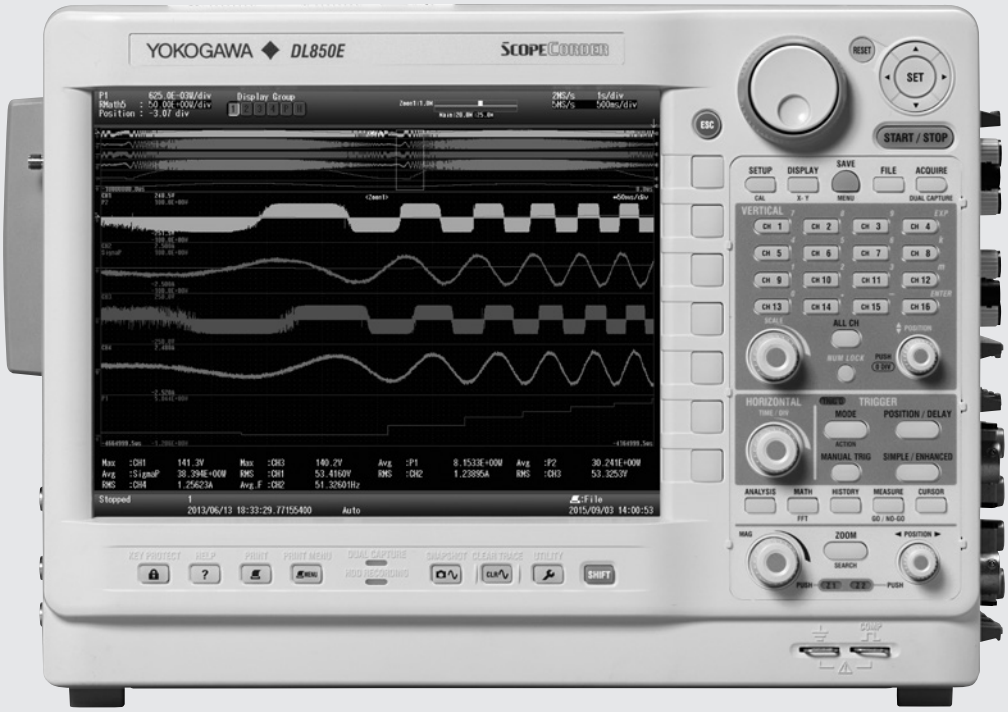
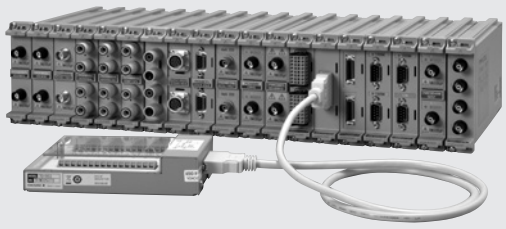
Test&Measurement

YOKOGAWA



Plug-in modules specifications

DL850E/DL850EV
ScopeCorder



Bulletin DL850E-01EN

Module Selection

Input	Model No.	Sample rate	Resolution	Bandwidth	Number of channels	Isolation	Maximum input voltage (DC+ACpeak)	DC accuracy	Note
Analog Voltage	720211*9	100 MS/s	12-Bit	20 MHz	2	Isolated	1000 V*2, 200 V*3	±0.5%	High speed · High voltage · Isolated
	701250*5	10 MS/s	12-Bit	3 MHz	2	Isolated	600 V*2, 200 V*3	±0.5%	high noise immunity
	701251	1 MS/s	16-Bit	300 kHz	2	Isolated	600 V*2, 140 V*3	±0.25%	High sensitivity range (1 mV/div), low noise (±100 µVtyp.), and high noise immunity
	720254	1 MS/s	16-Bit	300 kHz	4	Isolated	600 V*2, 200 V*3	±0.25%	4 CH BNC inputlow noise, high noise immunity
	701255*5	10 MS/s	12-Bit	3 MHz	2	Non-Isolated	600 V*4, 200 V*3	±0.5%	non-isolation version of model 701250
	701267	100 kS/s	16-Bit	40 kHz	2	Isolated	850 V*10	±0.25%	with RMS, and high noise immunity
	720220	200 kS/s	16-Bit	5 kHz	16	Isolated (GND-terminal) non-isolated (CH-CH)	42 V*3	±0.3%	16 CH voltage measurement (Scan-type)
Analog Voltage & Temperature	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)
	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), and low noise (±4 µVtyp.)
	720221*8	10 S/s	16-Bit	600 Hz	16	Isolated	42 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	701281	1 MS/s	16-Bit	resolution 625 ps	2	Isolated	420 V*2, 42 V*3	±0.1% (Frequency)	Measurement frequency of 0.01 Hz to 500 kHz, Measured parameters (frequency, rpm, period, duty, power supply frequency, distance, speed)
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	720240	100 kS/s	—	—	(60signals × 2) port	Isolated	10 V	—	CAN Data of max. 32-bit allowable It is available for DL850EV only. Max. two (2) modules can be installed in a main unit.*6 *7
CAN, LIN	720241	100 kS/s	—	—	(60signals × 2) port	Isolated	10 V (CAN port) 18 V (LIN port)	—	CAN port × 1, LIN port × 1 Available for DL850EV only, up to 2 modules*6 *7
SENT	720243	100 kS/s	—	—	11 data × 2 ports	Isolated	42 V	—	Supported protocol: SAE J2716. It is available for DL850EV only. Max. four (4) modules can be installed in a main unit.*6 *7

*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: Some of the models 701250/701255 shipped on or before July, 2007 may require factory rework. *6: Any other modules can be installed in the remaining slots.
*7: Up to four CAN Bus Monitor Modules (720240), CAN & LIN Bus Monitor Modules (720241) or SENT Monitor Module (720243) in total can be used on a single main unit. For the CAN Bus Monitor Modules (720240) and CAN & LIN Bus Monitor Modules (720241), up to two in total can be used on a single main unit. *8: The 16-CH Scanner Box (701953) is required for measurement.
*9: Class 1 Laser Product, IEC60825-1:2007 *10: In combination with 758933 and 701954.

Main Specifications (plug-in modules)

*1: Under standard operating conditions (temperature of 23°C ±5°C, 20 to 80% RH, warm-up of 30 min. or more), after calibration. Recommended calibration period: 1 year.
Note that the strain modules (701270/71) must be balanced.
*2 to *11: See the figure on page 6 for notes on the maximum input voltage and maximum allowable common mode voltage.
*12: See the figure on page 6 for the voltage-axis sensitivity setting.

High-Speed 100 MS/s, 12-Bit Isolation Module (720211)	
Input channels	2
Input type	Isolated unbalanced
Input coupling	AC, DC and GND
Maximum sample rate	100 MS/s
Frequency range (–3 dB)*1	DC to 20 MHz
Voltage-axis range setting	Direct input: 10 mV/div to 20 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)*2	1000 V (DC + ACpeak)
In combination with 701901 + 701954 (1:1)*6	200 V (DC + ACpeak)
Direct input*10	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)*3	1000 Vrms (CAT Ⅱ)
In combination with 701901 + 701954 (1:1)*9	1000 Vrms (CAT Ⅱ)
Direct input*11	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
–3 dB point when AC coupled low frequency attenuation point	10 Hz or less (1 Hz or less when using the 700929, 702902, 0.1 Hz or less when using the 701947)
Vertical (voltage) axis accuracy*1	DC accuracy: ±(0.5% of 10 div)
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ ±1%, approx. 35 pF
Common mode rejection ratio	80 dB (50/60 Hz) or more (Typ.)
Withstand voltage	1500 Vrms for 1 minute (across each terminal and earth) (60 Hz)
Insulation resistance	500 VDC, 10 MΩ or more (across each input terminal and earth)
A/D conversion resolution	12-bit (150 LSB/div)
Temperature coefficient	Zero point: ±(0.1% of 10 div)/°C (Typ.) Gain: ±(0.05% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/2 MHz/1.28 MHz/640 kHz/320 kHz/160 kHz/80 kHz/ 40 kHz/20 kHz/10 kHz
Probe attenuation setting	Voltage Probe 1:1, 10:1, 100:1, 1000:1
	Current Probe 1 A:1 V, 10 A: 1 V (for the 701932/701933) 100 A: 1 V (for the 701930/701931)
Weight	Approx. 300 g

High-Speed 10 MS/s, 12-Bit Isolation Module (701250)	
Input channels	2
Input type	Isolated unbalanced
Input coupling	AC, DC, and GND
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ ±1%, approx. 35 pF
Maximum sample rate	10 MS/s
Frequency range (–3 dB)*1	DC to 3 MHz
A/D conversion resolution	12-bit (150 LSB/div)
Voltage-axis sensitivity setting*12	5 mV/div to 20 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)*2	600 V (DC + ACpeak)
In combination with 701901 + 701954 (1:1)*6	200 V (DC + ACpeak) (as a value that meets the safety standard) 250 V (DC + ACpeak) (Max. allowable voltage, as a value that does not damage the instrument when applied.)
Direct input*10	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)*3	400 Vrms (O), 300 Vrms (CAT Ⅱ)
In combination with 701901 + 701954 (1:1)*9	400 Vrms (O), 300 Vrms (CAT Ⅱ)
Direct input*11	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
–3 dB point when AC coupled low frequency attenuation point	10 Hz or less (1 Hz or less when using the 700929/702902, 0.1 Hz or less when using the 701947)
Vertical (voltage) axis accuracy*1	DC accuracy: ±(0.5% of 10 div)
Temperature coefficient	Zero point: ±(0.05% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/500 Hz/5 kHz/50 kHz/500 kHz
Weight	Approx. 300 g

High-Speed 1 MS/s, 16-Bit Isolation Module (701251)		
Input channels	2	
Input type	Isolated unbalanced	
Input coupling	AC, DC, and GND	
Input connector	BNC connector (isolated type)	
Input impedance	1 MΩ ±1%, approx. 35 pF	
Maximum sample rate	1 MS/s	
Frequency range (–3 dB)[*1]	DC to 300 kHz (5 m V/div to 20 V/div) DC to 200 kHz (1 m V/div, 2 m V/div)	
A/D conversion resolution	16-bit (2400 LSB/div)	
Voltage-axis sensitivity setting[*12]	1 m V/div to 20 V/div (1-2-5 steps)	
Maximum input voltage (1 kHz or less)		
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)[*2]		600 V (DC + ACpeak)
In combination with 701901 + 701954 (1:1)[*6]		140 V (DC + ACpeak)
Direct input[*10]		42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)		
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)		400 Vrms (O), 300 Vrms (CAT Ⅱ)
In combination with 701901 + 701954 (1:1)[*9]		400 Vrms (O), 300 Vrms (CAT Ⅱ)
Direct input[*11]		42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
–3 dB point when AC coupled low frequency attenuation point	1 Hz or less (0.1 Hz or less when using the 700929/702902, 0.01 Hz or less when using the 701947)	
Vertical (voltage) axis accuracy[*1]	DC accuracy	5 mV/div to 20 V/div: ±(0.25% of 10 div) 2 mV/div: ±(0.3% of 10 div) 1 mV/div: ±(0.5% of 10 div)
Temperature coefficient	Zero point	5 mV/div to 20 V/div: ±(0.02% of 10 div)/℃ (Typ.) 2 mV/div: ±(0.05% of 10 div)/℃ (Typ.) 1 mV/div: ±(0.10% of 10 div)/℃ (Typ.)
	Gain	1 mV/div to 20 V/div: ±(0.02% of 10 div)/℃ (Typ.)
Bandwidth limit	OFF/400 Hz/4 kHz/40 kHz	
Weight	Approx. 300 g	

4-CH 1 MS/s 16-Bit Isolation Module (720254)		
Input channels	4	
Input type	Isolated unbalanced	
Input coupling	AC, DC, GND	
Input connector	BNC connector (isolated type)	
Input impedance	1 MΩ ±1%, approx. 35 pF	
Maximum sample rate	1 MS/s	
Frequency range (–3 dB)[*1]	DC to 300 kHz	
A/D conversion resolution	16-bit (2400 LSB/div)	
Voltage-axis sensitivity setting[*12]	10 mV/div to 50 V/div (1-2-5 steps)	
Maximum input voltage (1 kHz or less)		
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)[*2]		600 V (DC + ACpeak)
In combination with 701901 + 701954 (1:1)[*6]		200 V (DC + ACpeak), 400 V (DC + ACpeak) (Max. allowable voltage, as a value that does not damage the instrument when applied.)
Direct input[*10]		42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)		
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)[*3]		400 Vrms (O), 300 Vrms (CAT Ⅱ)
In combination with 701901 + 701954 (1:1)[*9]		400 Vrms (O), 300 Vrms (CAT Ⅱ)
Direct input[*11]		42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
–3 dB point when AC coupled low frequency attenuation point	1 Hz or less (0.1 Hz or less when using the 700929, 702902) (0.01 Hz or less when using the 701947)	
Vertical (voltage) axis accuracy[*1]	DC accuracy: ±(0.25% of 10 div)	
Temperature coeffi cient	Zero point: ±(0.02% of 10 div)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)	
Bandwidth limit	OFF/6.25 Hz/12.5 Hz/25 Hz/50 Hz/100 Hz/200 Hz/400 Hz/800 Hz/1.6 kHz/3.2 kHz/6.4 kHz/12.8 kHz/40 kHz	
Weight	Approx. 300 g	

High-Speed 10 MS/s, 12-Bit Non-Isolation Module (701255)		
Input channels	2	
Input type	Non-isolated, unbalanced	
Input coupling	AC, DC, and GND	
Input connector	BNC connector (metallic type)	
Input impedance	1 MΩ ±1%, approx. 35 pF	
Maximum sample rate	10 MS/s	
Frequency range (–3 dB)[*1]	DC to 3 MHz	
A/D conversion resolution	12-bit (150 LSB/div)	
Voltage-axis sensitivity setting[*12]	5 mV/div to 20 V/div (1-2-5 steps)	
Maximum input voltage (1 kHz or less)		
In combination with 701940 (10:1)		600 V (DC + ACpeak)
Direct input	200 V (DC + ACpeak) (as a value that meets the safety standard) 250 V (DC + ACpeak) (Max. allowable voltage, as a value that does not damage the instrument when applied.)	
–3 dB point when AC coupled low frequency attenuation point	10 Hz or less (1 Hz or less when using the 701940)	
Vertical (voltage) axis accuracy[*1]	DC accuracy: ±(0.5% of 10 div)	
Temperature coefficient	Zero point: ±(0.05% of 10 div)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)	
Bandwidth limit	OFF/500 Hz/5 kHz/50 kHz/500 kHz	
Weight	Approx. 300 g	

High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS) (701267)		
Input channels	2	
Input type	Isolated unbalanced	
Input coupling	AC, DC, GND, AC-RMS, and DC-RMS	
Input connector	Plug-in terminal (safety terminal)	
Input impedance	1 MΩ ±1%, approx. 35 pF	
Maximum sample rate	100 kS/s	
Frequency range (–3 dB)[*1]	Waveform observation mode	DC to 40 kHz
	RMS observation mode	DC, 40 Hz to 10 kHz
A/D conversion resolution	16-bit (2400 LSB/div)	
Voltage-axis sensitivity setting[*12]	20 mV/div to 200 V/div (1-2-5 steps)	
Maximum input voltage (1 kHz or less)		
In combination with 758933 + 701954 (1:1)[*6]		850 V (DC + ACpeak)
Direct input[*10]		42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)		
In combination with 758933 + 701954 (1:1)		H side: 700 Vrms (CAT Ⅱ)[*7] L side: 400 Vrms (CAT Ⅱ)[*8]
Direct input		H/L sides: 42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)[*11]
–3 dB point when AC coupled low frequency attenuation point	1 Hz or less	
Vertical (voltage) axis accuracy[*1]		
Waveform observation mode		DC accuracy: ±(0.25% of 10 div)
RMS observation mode		DC accuracy: ±(1.0% of 10 div)
AC accuracy (sinewave input)		±(1.5% of 10 div) At frequency of 40 Hz to 1 kHz
AC accuracy (crest factor 2 or less)		±(2.0% of 10 div) At frequency of 40 Hz to 1 kHz
AC accuracy (crest factor 3 or less)		±(3.0% of 10 div) At frequency of 40 Hz to 1 kHz
Temperature coefficient (Waveform observation mode)	Zero point: ±(0.02% of 10 div)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)	
Bandwidth limit	OFF/100 Hz/1 kHz/10 kHz	
Response time (RMS observation mode)	Rising (0 to 90% of 10 div)	100 ms (Typ.)
	Falling (100 to 10% of 10 div)	250 ms (Typ.)
Weight	Approx. 300 g	

16-CH Voltage Input Module (720220)		
Input channels	16	
Input type	Isolated unbalanced	
Input coupling	DC, GND (Selectable for each sub-CH)	
Maximum sample rate	200 kS/s (single CH) [10 kS/s when using 16-CH]	
Frequency range (–3 dB)[*1]	DC to 5 kHz	
Voltage-axis sensitivity setting	200 mV/div to 2 V/div (1-2-5 steps)	
Maximum input voltage (1kHz or less)	Direct input	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	Direct input	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Vertical (voltage) axis accuracy	DC accuracy	±(0.3% of 10 div)
Input connector	Spring-type terminal (removable per 8 CH)	
Input impedance	1 MΩ ±1%	
Common mode rejection ratio	80 dB (50/60 Hz) or more (Typ.)	
A/D conversion resolution	16-bit (2400 LSB/div)	
Temperature coefficient	Zero point: ±(0.02% of 10 div)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)	
Bandwidth limit	OFF/500 Hz (Selectable for each sub-CH)	
Weight	Approx. 250 g	

Universal (Voltage/Temp.) Module (701261) / with AAF (701262)	
Function	Temperature (thermocouple) or voltage measurement (switchable)
Input channels	2
Input type	Isolated unbalanced
Input coupling	TC (thermocouple), DC, AC, and GND
Input connector	Binding post
Input impedance	Approx. 1 MΩ
Maximum sample rate	Voltage: 100 kS/s
Data update rate	Temperature: 500 Hz
Frequency range (–3 dB)[*1]	Voltage: DC to 40 kHz Temperature: DC to 100 Hz
Vertical resolution	Voltage: 16-bit (2400 LSB/div) Temperature: 0.1℃

–3 dB point when AC coupled low frequency attenuation point	Voltage measurement: 0.5 Hz or less
Measurement range/accuracy*1	Voltage measurement: Voltage-axis sensitivity setting*12: 5 mV/div to 20 V/div (1-2-5 steps) Vertical (voltage) axis accuracy: ±(0.25% of 10 div)

Temperature measurement
(Does not include the reference junction temperature compensation accuracy.)

Type	Measurement Range	Accuracy
K E J T L U N	–200℃ to 1300℃ –200℃ to 800℃ –200℃ to 1100℃ –200℃ to 400℃ –200℃ to 900℃ –200℃ to 400℃ 0℃ to 1300℃	±(0.1% of reading + 1.5℃) Except ±(0.2% of reading + 1.5℃) for –200℃ to 0℃
R S	0℃ to 1700℃	±(0.1% of reading + 3℃) Except, 0 to 200℃: ±8℃ 200℃ to 800℃: ±5℃
B	0℃ to 1800℃	±(0.1% of reading + 2℃) Except, 400℃ to 700℃: ±8℃ Effective range is 400℃ to 1800℃
W	0℃ to 2300℃	±(0.1% of reading + 3℃)
Au7Fe3	0 K to 300 K	0 K to 50 K: ±4 K 50 K to 300 K: ±2.5 K

Maximum input voltage (1 kHz or less)	42 V (DC + ACpeak) (as a value that meets the safety standard) 150 V (DC + ACpeak) (maximum allowable voltage, as a value that does not damage the instrument when applied)
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Temperature coefficient (Voltage)	Zero point: ±(0.01% of 10 div)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)
Bandwidth limit	Voltage: OFF/AUTO (AAF)/40 Hz/400 Hz/4 kHz Temperature: OFF/2 Hz/8 Hz/30 Hz
Anti-aliasing filter (AAF) (701262 only)	Cutoff frequency (fc) automatically linked with the sampling frequency (fs) fs ≥ 100 Hz : fc = fs × 40% fs ≥ 50 Hz : fc = 20 Hz
Weight	Approx. 300 g

Temperature, High Precision Voltage Isolation Module (701265)

Function	Temperature (thermocouple) or voltage measurement (switchable)
Input channels	2
Input type	Isolated unbalanced
Input coupling	TC (thermocouple), DC, and GND
Input connector	Binding post
Input impedance	Approx. 1 MΩ
Data update rate	Temperature: 500 Hz
Frequency range (–3 dB)*1	DC to 100 Hz
Vertical resolution	Voltage: 16-bit (2400 LSB/div) Temperature: 0.1℃
–3 dB point when AC coupled low frequency attenuation point	Voltage measurement: 0.5 Hz or less
Measurement range/accuracy*1	Voltage measurement: Voltage-axis sensitivity setting*12: 100 µV/div to 10 V/div (1-2-5 steps) Vertical (voltage) axis accuracy: ±(0.08% of 10 div + 2 µV)

Temperature measurement
(Does not include the reference junction temperature compensation accuracy.)

Type	Measurement Range	Accuracy
K E J T L U N	–200℃ to 1300℃ –200℃ to 800℃ –200℃ to 1100℃ –200℃ to 400℃ –200℃ to 900℃ –200℃ to 400℃ 0℃ to 1300℃	±(0.1% of reading + 1.5℃) Except ±(0.2% of reading + 1.5℃) for –200℃ to 0℃
R S	0℃ to 1700℃	±(0.1% of reading + 3℃) Except, 0 to 200℃: ±8℃ 200℃ to 800℃: ±5℃
B	0℃ to 1800℃	±(0.1% of reading + 2℃) Except, 400℃ to 700℃: ±8℃ Effective range is 400℃ to 1800℃
W	0℃ to 2300℃	±(0.1% of reading + 3℃)
Au7Fe3	0 K to 300 K	0 K to 50 K: ±4 K, 50 K to 300 K: ±2.5 K

Maximum input voltage (1 kHz or less)	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Temperature coefficient (Voltage)	Zero point: ±((0.01% of 10 div)/℃ +0.05 µV)/℃ (Typ.) Gain: ±(0.02% of 10 div)/℃ (Typ.)
Bandwidth limit	OFF/2 Hz/8 Hz/30 Hz
Weight	Approx. 250 g

16-CH Temperature/Voltage Input Module (720221)

Input channels	16
Input type	Isolated unbalanced
Input coupling	TC (thermocouple), DC, GND
Data updating period	Switching among 100 ms, 300 ms, 1 s, and 3 s
Measurement range/accuracy	Voltage measurement: Voltage axis sensitivity: 1 mV/div to 2 V/div (1-2-5 steps) Voltage accuracy: ±(0.15% of 10 div)

Temperature measurement
(Does not include the reference junction temperature compensation accuracy.)

Type	Measurement Range	Accuracy
K E J T L U N	–200℃ to 1300℃ –200℃ to 800℃ –200℃ to 1100℃ –200℃ to 400℃ –200℃ to 900℃ –200℃ to 400℃ 0℃ to 1300℃	±(0.1% of reading + 1.5℃) Except ±(0.2% of reading + 1.5℃) for –200℃ to 0℃
R S	0℃ to 1700℃	±(0.1% of reading + 3℃) Except, 0 to 200℃: ±8℃ 200℃ to 800℃: ±5℃
B	0℃ to 1800℃	±(0.1% of reading + 2℃) Except, 400℃ to 700℃: ±8℃ Effective range is 400℃ to 1800℃
W	0℃ to 2300℃	±(0.1% of reading + 3℃)
Au7Fe3	0 K to 300 K	0 K to 50 K: ±4 K, 50 K to 300 K: ±2.5 K

Maximum input voltage (1 kHz or less)	Both voltage & temp. 42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	Both voltage & temp. 42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Vertical resolution	At voltage input: 2400 LSB/div At temp. measurement: 0.1°C
Common mode rejection ratio	At voltage measurement: 100 dB or more (50/60 Hz) (Typ.) At temp. measurement: 140 dB or more (at data updating rate of 3 s) (50/60 Hz) (Typ.)
Residual noise level	±0.01 div (Typ.)
A/D conversion resolution	At voltage measurement: 16 bits (2400 LSB/range)
Temperature coefficient	Zero point: ±(0.025% of 10 div)/℃ (Typ.) Gain: ±(0.01% of 10 div)/℃ (Typ.)
Reference junction comp. accuracy (at input terminal temp. balancing)	K, E, J, T, L, U, N: ±1℃ R, S, B, W: ±1.5℃ Au7Fe3: ±1 K
Bandwidth limit (Typ.) (–3 dB point)	At data updating period of 100 ms: 600 Hz At data updating period of 300 ms: 200 Hz At data updating period of 1 s: 50 Hz At data updating period of 3 s: 10 Hz
Input connector	Screwed type, External terminal mounting
Input impedance	Approx. 1 MΩ
Burnout detection function	ON/OFF available on channel basis
Channel-to-channel interference	100 dB or more (50/60 Hz) (Typ.)
Internal reference junction compensation	ON or OFF (Switchable)
External scanner box	Model: 701953 Supplied cable length: 1 m, 3 m (selectable)
Weight	Approx. 250 g

Strain Module (NDIS) (701270) / Strain Module (DSUB, Shunt-Cal) (701271)

Input channels	2
Input type	DC bridge (auto balancing), balanced differential input, and isolated
Auto balance type	Electronic auto balance
Auto balance range	±10000 µSTR (1 gauge method)
Bridge voltage	Select from 2 V, 5 V, and 10 V.
Gauge resistance	120 Ω to 1000 Ω (bridge voltage: 2 V) 350 Ω to 1000 Ω (bridge voltage: 2 V, 5 V, and 10 V)
Gauge factor	1.90 to 2.20 (set in 0.01 steps)
Maximum sample rate	100 kS/s
Frequency range (–3 dB)*1	DC to 20 kHz
A/D conversion resolution	16-bit (4800 LSB/div: Upper = +FS, Lower = –FS)
mV/V range support	mV/V range = 0.5 × (µSTR range/1000)

Measurement range/ measurable range

Measurement range (FS)	Measurable range (–FS to +FS)
500 µSTR	–500 µSTR to +500 µSTR
1000 µSTR	–1000 µSTR to +1000 µSTR
2000 µSTR	–2000 µSTR to +2000 µSTR
5000 µSTR	–5000 µSTR to +5000 µSTR
10000 µSTR	–10000 µSTR to +10000 µSTR
20000 µSTR	–20000 µSTR to +20000 µSTR

Maximum input voltage (1 kHz or less)	10 V (DC + ACpeak)

Maximum allowable common mode voltage (1 kHz or less)	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
DC accuracy[*1]	±(0.5% of FS + 5 µSTR)
Temperature coefficient	Zero point: ±5 µSTR/°C (Typ.) Gain: ±(0.02% of FS)/°C (Typ.)
Bandwidth limit	OFF/10 Hz/100 Hz/1 kHz
• NDIS (701270)	
Function	mV/V support. Supports the strain gauge transducer unit system.
Input connector	NDIS connector (Recommended by JSNDI (The Japanese Society for Non-destructive Inspection)
Standard accessories	NDIS connector : 2 pieces
Recommended bridge head (sold separately)	701955 (NDIS 120 Ω, comes with a 5-m cable) 701956 (NDIS 350 Ω, comes with a 5-m cable)
• DSUB, Shunt-Cal (701271)	
Function	mV/V support.
Supports	the strain gauge transducer unit system. Shunt calibration support. Built-in shunt calibration relay (1 gauge method).
Input connector	9-pin D-Sub connector (female)
Standard accessories	Connector shell set for soldering : 2 sets
Recommended bridge head (supports DSUB shunt-Cal) (sold separately)	701957 (D-Sub 120 Ω, comes with a 5-m cable) 701958 (D-Sub 350 Ω, comes with a 5-m cable)
Weight	Approx. 250 g

Acceleration/Voltage Module (with AAF) (701275)	
Input channels	2
Input type	Non-isolated, unbalanced
Input coupling	AC, DC, ACCL (acceleration), and GND
Input connector	BNC connector (metallic type)
Input impedance	1 MΩ ±1%, approx. 35 pF
Maximum sample rate	100 kS/s
Frequency range (–3 dB)[*1]	Acceleration: 0.4 Hz to 40 kHz Voltage: DC to 40 kHz
A/D conversion resolution	16-bit (2400 LSB/div)
Voltage-axis sensitivity setting[*12]	Acceleration (±5 V = ×1 range) X0.1 to ×1 to X100 (1-2-5 steps) Voltage: 5 mV/div to 10 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)[*10]	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)[*11]	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
–3 dB point when AC coupled low frequency attenuation point	0.4 Hz or less (0.04 Hz or less when using the 701940) (Typ.)
Vertical (voltage) axis accuracy[*1]	Voltage (DC accuracy): ±(0.25% of 10 div) Acceleration: ±(0.5% of range) at 1 kHz
Temperature coefficient (voltage) (excluding AUTO filter)	Zero point: ±(0.02% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/Auto (AAF)/40 Hz/400 Hz/4 kHz
Anti-aliasing filter (AAF)	Cutoff frequency (fc): automatically linked with the sampling frequency (fs) fs ≥ 100 Hz : fc = fs × 40% fs ≤ 50 Hz : fc = 20 Hz
	Cutoff characteristics: –65 dB at 2 × fc (Typ.)
Sensor supply current (voltage)	OFF/4 mA ±10% (approx. 22 VDC)
Applicable acceleration sensor	Built-in amplifier type Kistler Instruments Corp. : Piezotron™, PCB Piezotronics Inc. : ICP™, Endevco Corp : Isotron™, etc.
Weight	Approx. 300 g

Frequency Module (701281)		
Measurement function	Frequency (Hz), RPMs, RPSs, period (sec), duty cycle (%), power supply frequency (Hz), pulse width (sec), pulse integration, and velocity	
Input channels	2	
Input type	Isolated unbalanced	
Input coupling	AC and DC	
Input connector	BNC connector (isolated type)	
Input impedance	1 MΩ ±1%, approx. 35 pF Pull-up function: 10 kΩ, approx. 5 V (pull-up can be turned ON only when the input is set to Pull-Up 5 V)	
Data update rate	1 MHz (1 µs)	
Minimum measurement resolution	625 ps	
Measured data resolution	16-bit (2400 LSB/div)	
Input voltage range (±FS)	(1:1) ±1 V to ±50 V (1-2-5 steps)	
Maximum input voltage	In combination with 700929 (10:1)[*2]	420 V (DC + ACpeak)
	Direct input[*10]	42 V (DC + ACpeak)
Maximum allowable common mode voltage		
In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1)[*3]		300 Vrms (CAT Ⅱ)
Direct input[*11]		42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Bandwidth limit	OFF/100 Hz/1 kHz/10 kHz/100 kHz	
Comparator section	Preset function	Logic (5 V/3 V/12 V/24 V), electromagnetic pickup, zero crossing, pull-up (5 V), AC100 V, AC 200 V, and user-defined
	Threshold range	±FS range, resolution 1% units
	Hysteresis	±1%, ±2.5%, ±5% of FS
Chatter elimination function	OFF or 1 ms to 1000 ms (1 ms resolution)	
LED display (per CH)	ACT (green): Operating status (lights during pulse input) OVER (red): Overdrive status (lights when input exceeds range)	

Measured parameters and measuring range

Measured parameter	Measuring Range	Vertical axis sensitivity setting
Frequency (Hz)	0.01 Hz to 500 kHz	0.1 Hz/div to 100 kHz/div
RPMs	0.01 rpm to 100000 rpm	0.1 rpm/div to 10 krpm/div
RPSs	0.001 rps to 2000 rps	0.01 rps/div to 200 rps/div
Period (sec)	2 µs to 50 s	10 µs/div to 5 s/div
Duty cycle (%)	0% to 100%	1%/div to 20%/div
Power supply frequency (Hz)	(50 Hz, 60 Hz, 400 Hz) ±20 Hz	0.1 Hz/div to 2 Hz/div
Pulse width (sec)	2 µs to 50 s	10 µs/div to 5 s/div
Pulse integration	Up to 2×10^9 pulses	10×10^{-21} value/div to 0.5×10^{21} value/div
Velocity	Measuring range same as frequency (units can be converted to km/h, etc.)	

Measurement accuracy[*1]

- When in frequency, RPM, RPS, or velocity measurement mode
  - Measurement accuracy: ±(0.05% of 10 div + accuracy dependent on the input frequency)
  - Accuracy dependent on the input frequency

2 kHz or less	0.05% of the input frequency + 1 mHz
2 kHz to 50 kHz	0.05% of the input frequency
50 kHz to 100 kHz	0.1% of the input frequency
100 kHz to 200 kHz	0.2% of input frequency
200 kHz or higher	0.5% of the input frequency

- When in period measurement mode
  - Measurement accuracy: ±(0.05% of 10 div + accuracy dependent on the input frequency)
  - Accuracy dependent on the input period

500 µs or greater	0.05% of the input period
20 µs to 500 µs	0.1% of the input period + 0.1 µs
10 µs to 20 µs	0.2% of the input period + 0.1 µs
10 µs or less	0.5% of the input period + 0.1 µs

- When in duty cycle measurement mode
  - Accuracy dependent on the input frequency

50 kHz or less	±0.1%
50 kHz to 100 kHz	±0.2%
100 kHz to 200 kHz	±0.5%
200 kHz to 500 kHz	±1.0%

- When in pulse width measurement mode
  - Measurement accuracy: ±(0.05% of 10 div + accuracy dependent on the input pulse width)
  - Accuracy dependent on the input pulse width

500 µs or greater	0.05% of the input pulse width
20 µs to 500 µs	0.1% of the input pulse width + 0.1 µs
10 µs to 20 µs	0.2% of the input pulse width + 0.1 µs
10 µs or less	0.5% of the input pulse width + 0.1 µs

- When in power supply frequency mode
  - Measurement accuracy
    - When the center frequency is 50/60 Hz: ±0.03 Hz (0.01 Hz resolution)
    - When the center frequency is 400 Hz: ±0.3 Hz (0.01 Hz resolution)

Auxiliary measurement functions

Deceleration prediction	Computes the deceleration condition in realtime when the pulse input is cut off. Can be specified when measuring the frequency, RPMs, RPSs, period, and velocity.
Stop prediction	Sets the frequency to 0 after a certain time elapses after the pulse input is cut off. Stop interval setting: Set in the range of 1.5 to 10 times (10 settings) the period of the pulse measured last. Can be specified when measuring the frequency, RPMs, RPSs, period, and velocity.
Smoothing	Computes the moving average of the measured data using the specified time. Specified time: 0.1 to 1000 ms (0.1 ms resolution). Can be specified on all measurement parameters.
Pulse average	Performs frequency measurement per specified number of pulses. When fluctuation exists periodically in the pulse interval, the fluctuation can be eliminated. Specified number of pulses: 1 to 4096. Can be specified when measuring the frequency, RPMs, RPSs, power supply frequency, period, pulse integration, and velocity.
Offset function	Observe fluctuation with respect to the offset frequency. Offset range: Can be set up to 100 times the maximum range value.

Weight	Approx. 300 g

Logic Input Module (720230)	
Input ports	2
Input type	non-isolated
Input bits	8-bit/Port
Maximum sample rate	10 MS/s

Compatible probes	Model: 700986 (8-bit, non isolated input) Model: 700987 (8-bit, isolated input) Model: 702911 (8-bit, non-isolated input, support contact input) Model: 702912 (8-bit, non-isolated input, support contact input)
Weight	Approx. 250 g

CAN Bus Monitor Module (720240)	
Input ports	2
Input type	Isolated (across port and main unit, across each port)
Input connector	D-Sub 9-pin (male)
Input channels	60 signals/port
Maximum sample rate	100 kS/s (60-CH × 1 kS/s per port)
Bit rate	10 k, 20 k, 33.3 k, 50 k, 62.5 k, 66.7 k, 83.3 k, 100 k, 125 k, 250 k, 500 k, 800 k,1 Mbps
Supported protocol	Physical layer: ISO-11898 (High Speed Communication) CAN in Automation: CAN2.0B (Standard & extended massage format)
Terminator	Built-in, it is switchable On and Off per port.
Endian	Little or Big selectable
LED display	CAN Ch1: TERM on the panel, CAN Ch2: TERM on the panel
Channel setting	Message ID (Standard or Extended) Extraction Position Bit Length (Max. 32-bit) Select the Endian (little or big) Convert physical value
Output function	Single shot Specified ID (Data) can be outputted manually.
Allowable voltage range	–3 to 10 V
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Weight	Approx. 250 g

This module is available for DL850EV only. Max. two (2) modules including the 720241 module can be installed.

CAN & LIN Bus Monitor Module (720241)		
Input ports	CAN port: 1, LIN port: 1	
Input type	Isolated (across port and main unit, across each port)	
Maximum sampling rate	100 kS/s (60-CH × 1 kS/s per port)	
LIN port specifications	Maximum input voltage	–1 V to +18 V (LIN input to GND)
	LIN supply voltage input range	7 V to 18 V
	Maximum allowable common mode voltage	30 Vrms (CAT Ⅱ)
	Input connector	D-sub 9-pin (male)
	Supported protocol	Physical layer: ISO-9141
	Supported bit rate	2400, 9600, 19200 bps
	Supported data length	4 bytes maximum
	Input channels	60-signal/port
	Supported data field checksum	Standard and extended checksums
CAN port specifications	Compliant with CAN Bus Monitor Module (720240)	
Weight	Approx. 250 g	

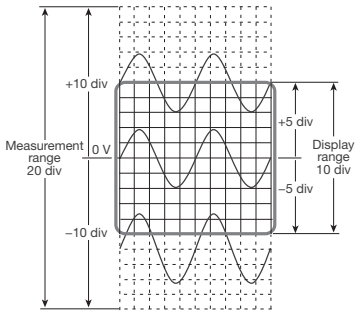
This module is available for DL850EV only. Max. two (2) modules including the 720240 module can be installed.

SENT Monitor Module (720243)	
Input ports	2
Input type	Isolated
Maximum sampling rate	100 kS/s (10 µs)
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ ±1%, approx. 35 pF
Supported protocol	SAE J2716
Clock Tick	1 µs to 100 µs (set in 0.01 steps)
Nibble	1 to 6
Channel setting	FAST CHANNEL 3 CH SLOW CHANNEL 5 CH STATUS & COMMUNICATION 1 CH (4 bit) Error 1 CH Error count 1 CH
L input voltage	1.5 V (Typ.)
H input voltage	3.5 V (Typ.)
Input status indication	Status indication through LED In operation: Illuminates in green when input is detected. Overdriven: Illuminates in red when the input voltage exceeds 20 V.
Maximum input voltage	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Maximum allowable common mode voltage	42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Weight	Approx. 300 g

Measurement Range and Display Range

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.

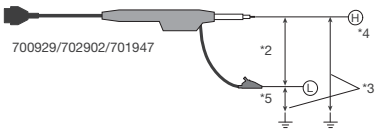
- Move the vertical position.
- Set the offset voltage.
- Zoom in or out of the vertical axis (expand/reduce).



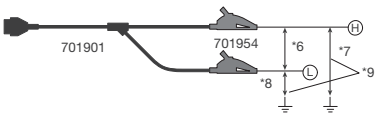
Maximum Input Voltage and Maximum Allowable Common Mode Voltage

See Specifications of Plug-in Modules

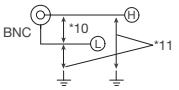
In combination with 700929/702902/701947



In combination with 701901 + 701954



Direct input
(with a cable which doesn't comply with the safety standard)



WARNING
Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage. To prevent the possibility of electric shock, be sure to furnish protective earth grounding of the main unit. To prevent the possibility of electric shock, be sure to fasten the module screws.

Main Specifications (probes and accessories)

100:1 Probe (for Isolated BNC Input) (701947)	
Total length	1.5 m
Input impedance/capacitance	100 MΩ ±1%*1 /7 pF
Attenuation ratio	100:1
Frequency range (–3 dB)	DC to 200 MHz
Voltage coefficient	0.001%/V (Typ.)
Maximum input voltage*2	Space between shield and earth. ±1000 V (DC + ACpeak) CAT Ⅱ ±1000 V (DC + ACpeak) CAT Ⅰ Space between tip and shield, tip and earth. ±1000 V (DC + ACpeak) CAT Ⅱ ±3540 V (DC + ACpeak) CAT Ⅰ

*1: When the input impedance of the measuring instrument is 1 MΩ ±1%.
*2: When the input voltage is AC, the maximum allowable input decreases depending on the frequency.

10:1 Probe (for Isolated BNC Input) (700929)	
Frequency range (–3 dB)	DC to 100 MHz
Attenuation ratio	10:1
Input impedance/capacitance	10 MΩ/approx. 18 pF
Maximum input voltage (probe alone)	1000 V (DC + AC peak) Space between clip and lead, lead and earth. When the input voltage is AC, the maximum allowable input decreases depending on the frequency.

10:1 Passive Probe (Wide operating temperature range) (702902)	
Frequency range (–3 dB)	DC to 60 MHz
Attenuation ratio*	10:1 (Fixed) ±2% (5 to 40℃) ±3% (–40 to 5℃, 40 to 85℃)
Input resistance/capacitance*	10 MΩ ±2%/17.0 pF (Typ.)
Maximum input voltage	Between the pincher tip and safety ground lead ±1000 V (DC + ACpeak) CAT Ⅱ Between safety ground lead and ground ±1000 V (DC + ACpeak) CAT Ⅱ
Operating temperature range	–40 to +85℃

*In conjunction with a measuring instrument with an input impedance of 1 MΩ±1%.

Current Probe (701933)	
Frequency range (–3 dB)	DC to 50 MHz
Maximum continuous input range	30 Arms (AC and DC components) (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	50 Apeak, non-continuous
Output voltage rate	0.1 V/A
Amplitude accuracy	To 30 Arms: ±1% rdg ±1 mV 30 Arms to 50 Apeak: ±2% rdg (DC, and 45 to 66 Hz)

Current Probe (701930)	
Frequency range (–3 dB)	DC to 10 MHz
Maximum continuous input range	150 A (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	300 Apeak, non-continuous
Output voltage rate	0.01 V/A
Amplitude accuracy	To 150 A: ±1% rdg ±1 mV 150 A to 300 A: ±2% rdg (DC, and 45 to 66 Hz)

Current Probe (701931)	
Frequency range (–3 dB)	DC to 2 MHz
Maximum continuous input range	500 A (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	700 Apeak, non-continuous
Output voltage rate	0.01 V/A
Amplitude accuracy	To 500 A: ±1% rdg ±5 mV 500 A to 700 A: ±2% rdg (DC, and 45 to 66 Hz)

Differential Probe (700924)	
Frequency range (–3 dB)	DC to 100 MHz
Attenuation ratio	Switched ratios of 100:1 and 1000:1
Input impedance/capacitance	4 MΩ/approx. 10 pF
Differential allowable voltage	±1400 V (DC + ACpeak) or 1000 Vrms at 1000:1 attenuation ±350 V (DC + ACpeak) or 250 Vrms at 100:1 attenuation
Max common mode voltage	±1400 V (DC + ACpeak) or 1000 Vrms
Max input voltage (to ground)*	±1400 V (DC + ACpeak) or 1000 Vrms

*Derating is applied towards frequencies.

High Voltage Differential Probe (701926)	
Frequency range (–3 dB)*	DC to 50 MHz
Attenuation	1000:1 or 100:1, switchable
Input resistance and capacitance (Typ.)	50 MΩ + approx. 17 pF (parallel with respect to ground)
Allowable differential voltage (between + and – terminals)	5000 V rms or less and 7000 Vpeak or less at 1000:1 attenuation 500 V rms or less and 700 Vpeak or less at 100:1 attenuation
Allowable common mode voltage	5000 Vrms or less and 7000 Vpeak or less
Maximum input voltage (to ground)*	1000 Vrms CAT Ⅲ 5000 Vrms and 7000 Vpeak CAT Ⅰ
Operating conditions	5 to 40℃, 25 to 85%RH (no condensation)
Power requirements	• Internal battery: Four AA dry cells • External power supply: 6 VDC/200 mA or more or 9 VDC/150 mA or more • From the probe power supply terminal of the DL Series, the 701934 using the probe power cable
External dimensions	202 mm × 83 mm × 38 mm (excluding connector and cable)
Weight	Approx. 500 g (excluding batteries)

*Derating is applied towards frequencies.

Passive Probe (701940)	
Frequency range (–3 dB)	DC to 10 MHz at 10:1 attenuation DC to 6 MHz at 1:1 attenuation
Attenuation ratio	Switched ratios of 10:1 and 1:1
Input impedance/capacitance	10 MΩ/approx. 22 pF (10:1), 200 pF max. (1:1)
Maximum input voltage (probe alone)	600 V (DC + AC peak)

Logic Probe (702911: 1 m and 702912: 3 m)	
Number of inputs	8
Input type	Non-isolated (earth of all bits is common, main unit earth and earth of all bits are common)
Maximum input voltage	±35 V
Response time	3 µs (Typ.)
Input impedance	10 kΩ or greater
Threshold level	Approx. 1.4 V
Input level	TTL level or contact input (switching type)

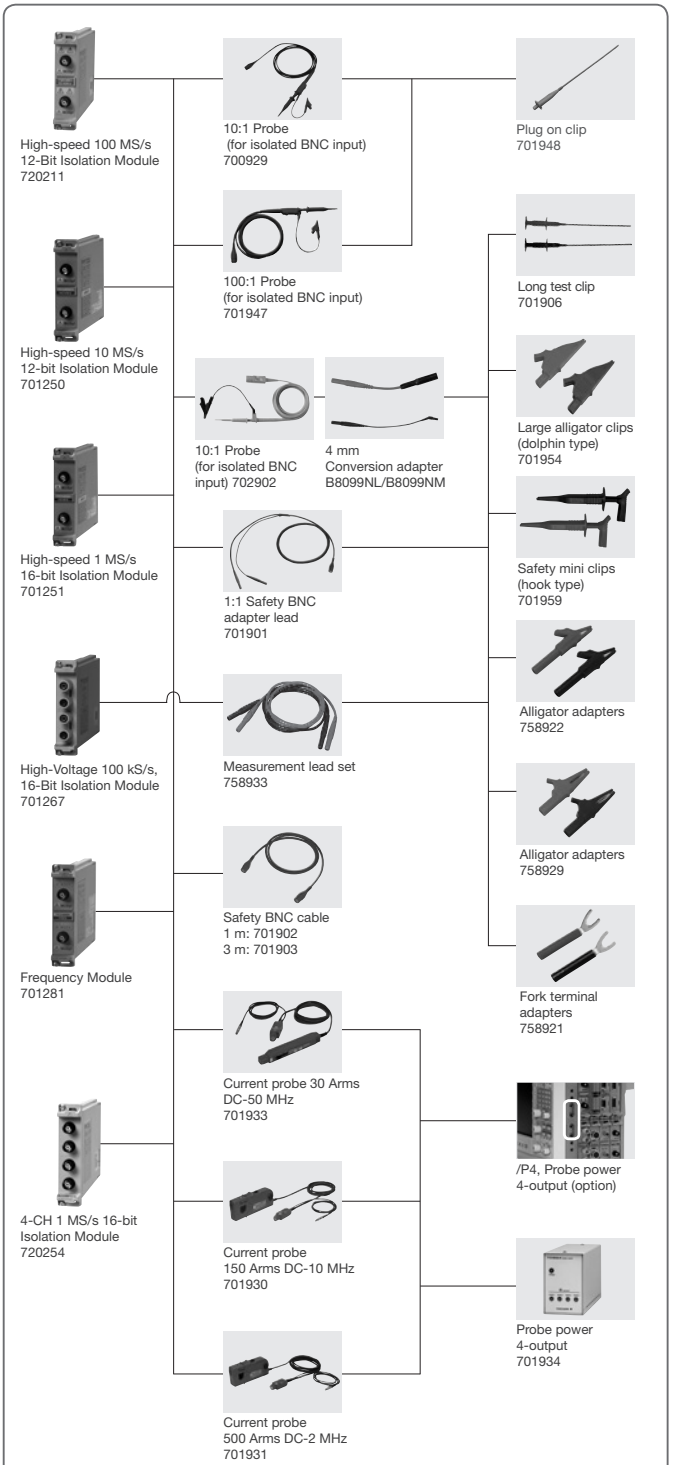
High-Speed Logic Probe (700986)	
Number of inputs	8
Input type	Non-isolated (earth of all bits is common, Main unit earth and earth of all bits are common)
Maximum input voltage (1 kHz or less)(across probe tip and earth)	42 V (DC + ACpeak)
Response time	1 µs (Typ.)
Input impedance	Approx. 100 kΩ
Threshold level	Approx. 1.4 V

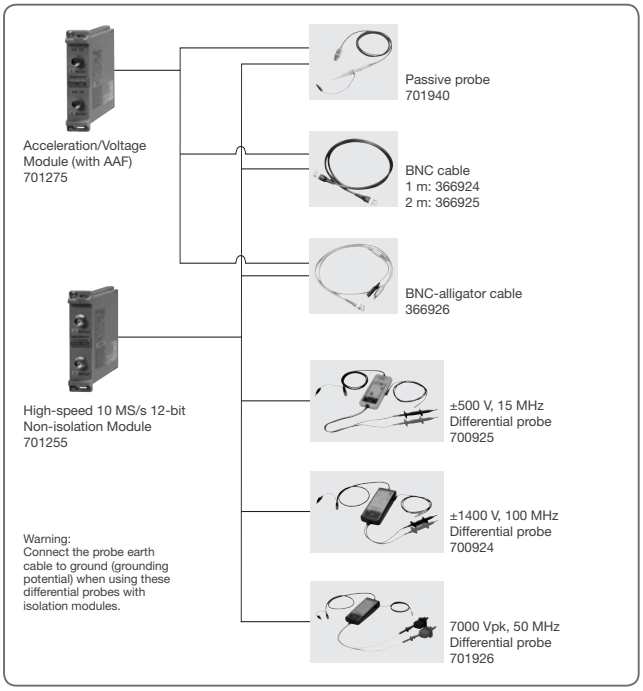
Isolation Logic Probe (700987)		
Number of inputs	8	
Input type	Isolated (all bits are isolated)	
Input connector	Safety terminal type (for banana plug) × 8	
Input switching	Can switch between AC/DC input for each bit	
Applicable input range	DC input	H/L detection of 10 VDC to 250 VDC
	AC input	H/L detection of AC type of 80 VAC to 250 VAC 50/60 Hz
Threshold level	DC input	6 VDC ±50%
	AC input	50 VAC ±50%
Response time	DC input	within 1 ms (Typ.)
	AC input	within 20 ms (Typ.)
Maximum input voltage (1 kHz or less) (across H and L of each bit)	250 Vrms (CAT Ⅱ)	
Maximum allowable common mode voltage (1 kHz or less)	250 Vrms (CAT Ⅱ)	
Maximum allowable voltage between bits	250 Vrms (CAT Ⅱ)	
Input impedance	Approx. 100 kΩ	

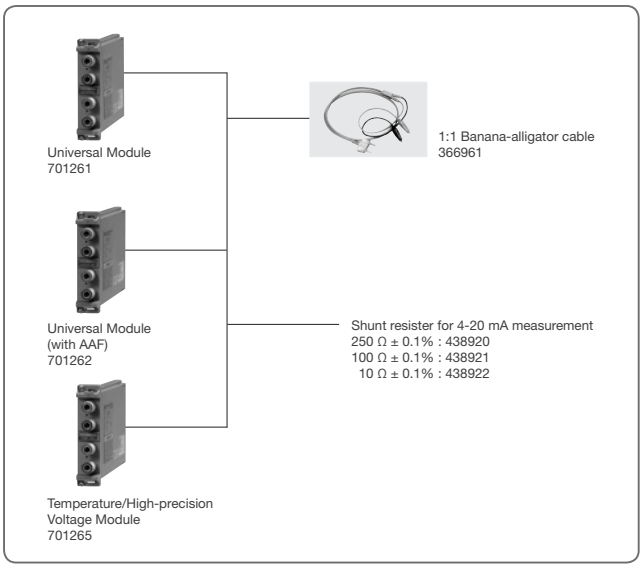
Bridge Head (701955, 701956, 701957, 701958)	
Bridge resistance	Model 701955, 701957 : 120 Ω Model 701956, 701958 : 350 Ω
Applicable gauge methods	Single-gauge, Single-gauge three-wire, Adjacent-side two-gauge, Opposed-side two-gauge, Opposed-side two-gauge three-wire, Four-gauge
Operating conditions	Temperature: 5 to 40°C Humidity: 20 to 85% RH
External dimensions	701955, 701956: Approx. 37 (W) × 97 (H) × 30 (D) mm 701957, 701958: Approx. 50 (W) × 101 (H) × 29 (D) mm
Weight	701955, 701956: Approx. 85 g (Bridge head only) 701957, 701958: Approx. 100 g (Bridge head only)

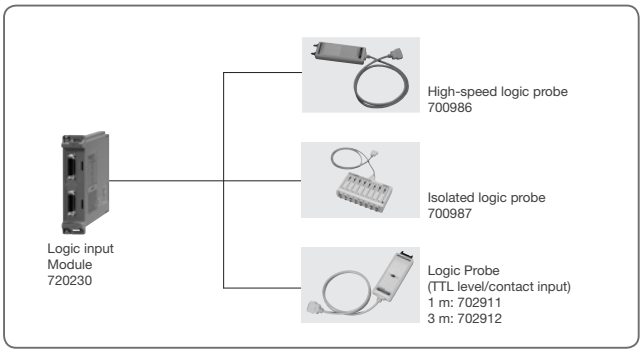
Power Supply (701934)	
Compatible Probes	Current probe: 701930, 701931, 701932, 701933, 700937 Differential probe: 701920, 701921, 701922, 700924
No. of Power Receptacles	4
Output Voltage	±(12 ±0.5) V
Rated Output Current	±2.5 A (total value for each output)
Rated Supply Voltage	100 to 240 VAC (actual power supply voltage may fluctuate within ±10% of the rating)
Ripple Voltage	50 mVp-p
Rated Power	190 VA Max. (at the rated output current)
External Dimensions	80 (W) × 119 (H) × 200 (D) mm
Weight	Approx. 1.2 kg

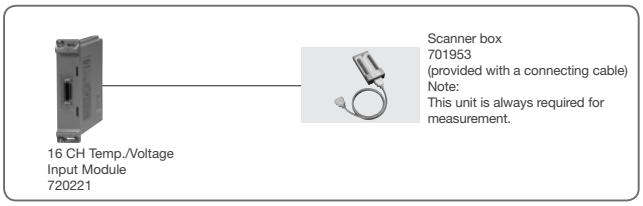
Module and accessory combinations











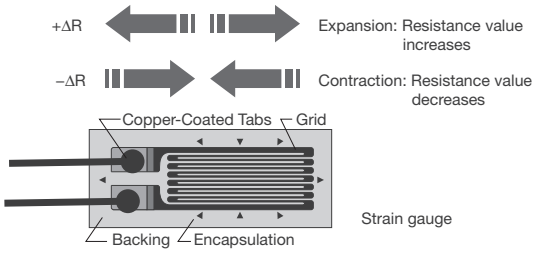
Strain Module (NDIS)
(Model: 701270)

Strain Module (DSUB, Shunt-CAL)
(Model: 701271)

Two types of modules are available depending on differences in the input connectors and support for shunt calibration. These support not only strain gauges, but also strain gauge type sensors.

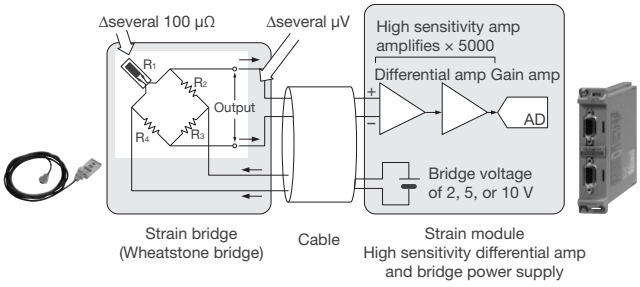
Strain gauge

A strain gauge is a sensor that detects mechanical stress (strain). It works on the principle that the resistance value of a metal foil changes as it expands and contracts. The strain gauge uses a specialized sensor that is affixed in the direction of expansion and contraction with an instant adhesive.



Strain gauge

The strain gauge's rate of change in resistance is very small. For instance, when using a 120 Ω strain gauge, the change in resistance corresponding to a strain of 1000 μSTR is 0.24 Ω. Relative to a strain of 1 μSTR, the resistance change is only 0.00024 Ω. Converting such minute resistance changes to voltage requires a Wheatstone bridge.



Strain gauge and measurement circuit

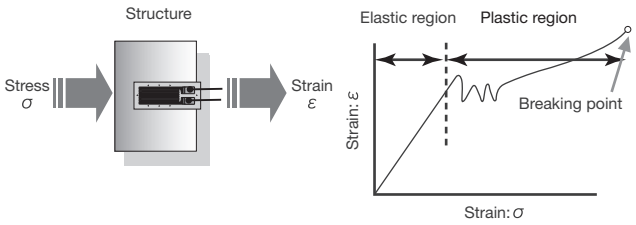
Furthermore, because the bridge output is as small as a few micro volts, the input must be amplified inside the strain module using a differential and high gain amp. The DL850E provides amplification of 5000 times.

You can select a bridge voltage (DC) of 2, 5, or 10 V. The higher the input voltage the higher the output voltage. Therefore, low noise measurements are possible, but only a bridge resistance of 350 ohm is supported at 5/10 V.

Measuring with a strain module

You can determine structural durability (elasticity) by measuring the strain.

$\sigma = \varepsilon E$ σ: stress ε: strain E: elasticity (Young's modulus)

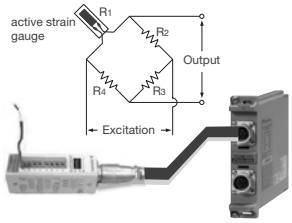


Relationship between strain and stress

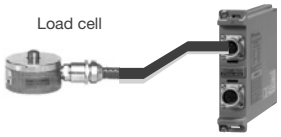
Stress is calculated using the relationship of elasticity (Young's modulus), which depends on structure's material, and the durability of the structure.

A strain gauge type sensor uses built-in strain gauge to measure stresses that occur with changes in various physical quantities (load, pressure, displacement, vibration, torque, etc.) based on the above principle. It then converts those to the original physical quantities and outputs them.

Connecting to a strain module



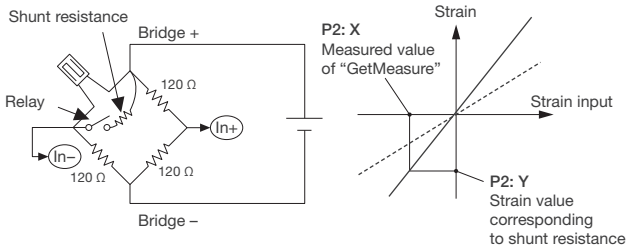
For strain measurements with a strain gauge, use the accessory bridge head.



Strain gauge type sensors are connected directly.

Shunt calibration

Shunt calibration (shunt CAL) means correcting the gain in strain measurements by inserting a known resistance (shunt resistance) in parallel with the strain gauge. Correction can be made without introducing a load, and while not perfectly accurate the correction can include the gauge wiring cables.



Gain correction using shunt CAL
(gain correction on the negative (–) side)

The model 701271 Strain Module (DSUB, shunt CAL) supports shunt calibration. A bridge head that supports shunt CAL (model 701957 or 701958) is required to execute shunt CAL.

Acceleration/Voltage Module
(with Anti-Aliasing Filter) (Model: 701275)

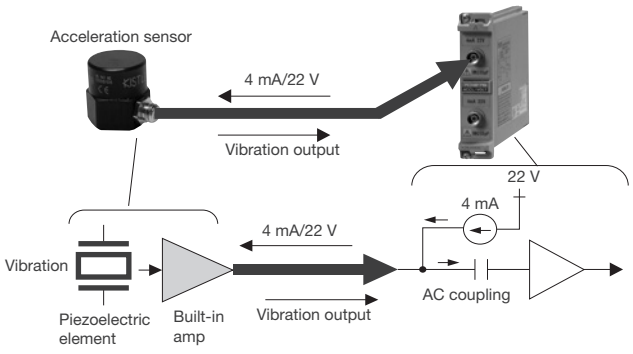
This module will accept direct input from a built-in amp type acceleration sensor to measure acceleration. You can also connect a charge output type acceleration sensor via a commercially available charge converter. Additionally, the module doubles as a voltage module to support common voltage measurements, and an effective anti-aliasing filter is built in for FFT analysis.

Built-in amp type acceleration sensors

Built-in amp type acceleration sensors use a voltage (piezoelectric) method, and have a built in piezoelectric element that emits a charge from the area of distortion when it encounters mechanical stress. When vibration occurs, a charge is generated on both ends of the element. Vibration is measured by measuring the voltage proportional to the generated charge.

DC power (4 mA/22 V) is supplied from the module to the sensor, and the vibration detected by the sensor is fed back to the module as AC output. The DC component is cut from the vibration output to isolate the AC component which is then amplified.

The model 701275 Acceleration/Voltage Module supports built-in amp type acceleration sensors. No charge amp is required, allowing sensors to be connected directly. It has low impedance, thus offering anti-noise characteristics.



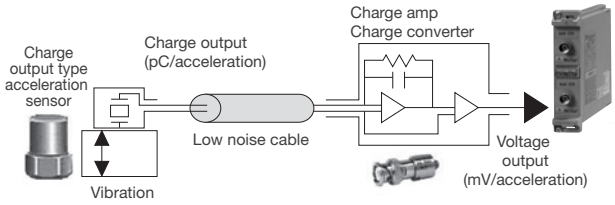
Connecting a built-in amp type acceleration sensor

The 701275 Acceleration/Voltage Module can connect to any built-in amp type acceleration sensor that supports a constant drive current of 4 mA and drive voltage of 22 V. Please check the sensor's spec sheet to ensure you are using one that meets the constant drive current and voltage (range) requirement of 4 mA and 22 V. They are available from the following manufacturers.
Kistler: Piezotron™[1] PCB: ICP™[1] Endevco: isotron2™[1]

1. These are registered trademarks.

Charge output type acceleration sensors

When you need to perform measurements by connecting a charge output type acceleration sensor, you can input to the 70125 Acceleration/Voltage module through a commercially available charge converter or charge amp.



Connecting a charge output type acceleration sensor

The electric charge proportional to acceleration (pC/acceleration) is conveyed to the charge amp via a low noise cable. The charge amp converts charge to voltage (mV/acceleration). Because impedance is high and charge is small, the signal is susceptible to noise and caution should be exercised. The drive current/voltage needed for connecting a built-in amp type acceleration sensor is not required with charge output type acceleration sensors.

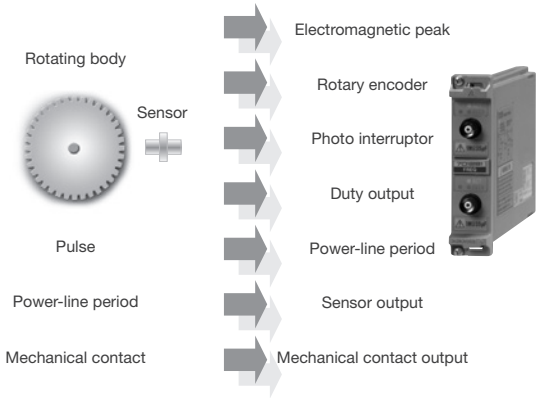
When using the model 701275 Acceleration/Voltage Module to measure acceleration, enter output units (sensitivity, mV/unit) that are appropriate for the acceleration sensor being used. The output units are included on the sensor's spec sheet.
When connecting a built-in amp type acceleration sensor, turn ON the bias output (constant drive current).

Using the Frequency Module (701281)

Frequency Module (Model: 701281)

This module incorporates all the functions and performance required for measuring rotating bodies (pulses). It performs measurement of 9 different items, and reads in measured values directly.

With isolated input, its measurement range is 0.01 Hz to 500 kHz. Measured values are updated at high speed (1 µs/1 MHz) for real time confirmation.



DUTs of the Frequency module

Frequency module test items

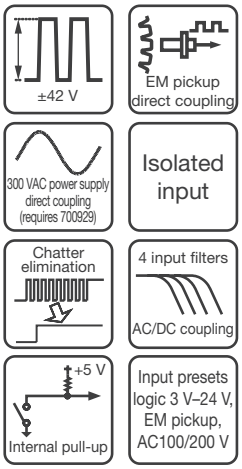
Test item	Real-time calculation	Measurement range[1]	Measurement
Frequency (Hz)	Frequency (Hz) = $\frac{1}{\text{Tw (s)}}$	0.01 Hz to 500 KHz	
Period (s)	Period (s) = Tw (s)	2 µs to 50 s	
Rpm	Rpm = $\frac{\text{freq. (Hz)}}{\text{pulses per revolution (Nr)}} \times 60$	0.01 rpm to 100000 rpm	
Rps	Rps = $\frac{\text{freq (Hz)}}{\text{pulses per revolution (Nr)}}$	0.001 rps to 2000 rps	
Duty (%)	Duty (%) = $\frac{\text{Thigh (s)}}{\text{Tw (s)}}$ or $\frac{\text{Tlow (s)}}{\text{Tw (s)}}$	0% to 100%	
Pulse width	Pulse width (sec) = Thigh (s) or Tlow (s)	2 µs to 50 s	
Power Supply Freq. (Hz)	Power supply freq. (Hz) = $\frac{1}{\text{Tw (s)}}$ at the 50/60 Hz setting, 0.01 Hz resolution	(50 Hz, 60 Hz, 400 Hz) ±20 Hz	
Pulse Integration (Distance/ Quantity of flow)	Distance = N (count) × distance per pulse ℓ *Distance ℓ and units are user-definable.	up to 2 × 10⁹ count	
Velocity (km/h, mph)	Velocity (km/h) = $\frac{\text{distance per pulse ℓ (km)}}{\text{Tw (s)}} \times 3600$ Velocity (m/s) = $\frac{\text{distance per pulse ℓ (m)}}{\text{Tw (s)}}$ *Units are user-definable (angular velocity and other units)	$F = \left(\frac{1}{Tw}\right)$ = 0.01 Hz to 200 kHz	

1 Allowable input frequency range: 0.01 Hz to 200 kHz

Unlike general FV converters, the model 701281 Frequency Module does not require scale conversion when acquiring measurement items such as the ones in figure 1 because it can read in values directly. It not only displays data as waveforms, but enables cursor and waveform parameter measurement of those waveforms.

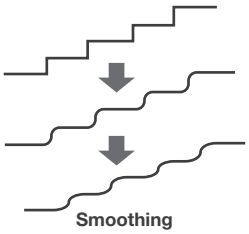
Input signals

A variety of signal types can be input, such as encoder pulse input of up to ±42 V, powered electromagnetic pickup direct input (1:1), and AC power of up to 300 V (when using a 10:1 probe). The isolation function, amplifier, and filters are all equivalent to those in a normal voltage module, therefore it supports a broad range of voltage (6 ranges) and input formats. Precise chattering elimination from 1 ms to 1 s is supported. The unit comes configured with menu presets for logic input (3 V to 24 V), electromagnetic pickup, AC power, and other inputs.



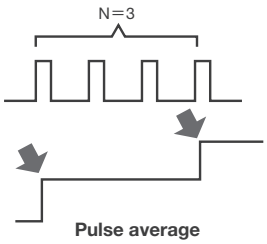
Real-time digital filtering

Smoothing filter (Moving average)
Smooth stair-step shaped waveforms. Updating occurs every 1 µs, giving a high speed averaging effect. Filters are set at 0.1 ms to 1 sec (up to the 25000th order). Filters reduce jitter in observed waveforms, and increases resolution.



Smoothing (moving average)

Pulse average
Useful for determining the average value per rotation, or determining the number of rotations when a gear is missing teeth. Output is averaged every specified number of pulses (between 1 and 4096 pulses).



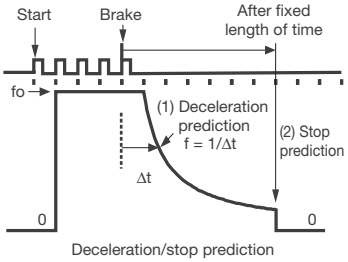
Pulse average

Supports braking applications

By predicting the deceleration curve and stop point, the module automatically compensates for the lack of information on encoder pulses which occur during deceleration.

Deceleration Prediction (1)
Automatically calculates and outputs a deceleration curve based on the interval of the last input pulse.

Stop Prediction (2)
If no pulses are inputted for a period of time, a stop is inferred, and output is set to 0. Up to 10 steps can be specified.



Deceleration/stop prediction

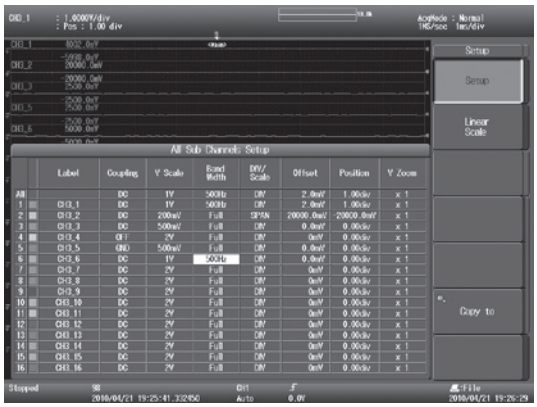
You can detect actions from pulse output stop (break, etc.) to the actual stop, therefore it is effective for applications involving pulse measurement associated with deceleration and stopping.

16-CH Voltage Input Module (Model: 720220)

This is a multichannel voltage module capable of measuring 16 channels (subchannels) of DC voltage on a single unit. Scan method measurements are possible by using a removable spring-type terminal block (removable in 8 channel sections) at the input. The input section uses Weidmueller B2L 3.5/16LH clamp connectors.
The maximum sampling rates are 200 kS/s (for 1 CH) and 10 kS/s (for 16 CH simultaneously). The minimum voltage input range is 200 mV/div, and the maximum input voltage is 42 V (direct input, 1 kHz or less).
You can build a 128-CH measuring system by installing up to eight modules in a single DL850E/DL850EV.
Input terminal blocks are isolated from ground. There is no isolation between channels within the input terminal block.

Setting subchannels

On each of the 16 channels (subchannels) in the module, you can individually set the range and other input conditions, position, zoom, and other display conditions.

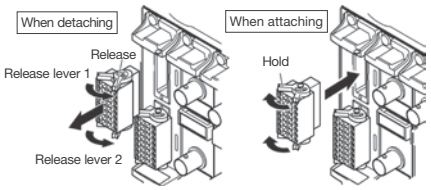


Channel setting screen

Connecting wires to terminal block

The following electrical wire is recommended.
0.20 mm^2 to 1.00 mm^2 (two solid wires or thin stranded wire).
AWG size: 24-18

Strip approx. 7 mm of the insulation from the end of the wire and insert the end into a wire inlet of a terminal block.
A terminal block can be detached from the module as shown right; wires can be easily installed.



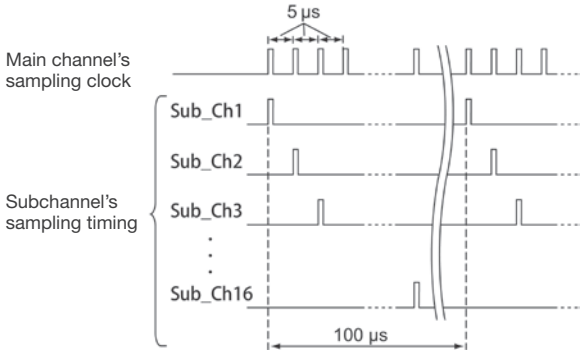
Number of subchannels to be used, sampling rate, and record length

Subchannels under measurement (those set to ON) are sampled in turn. As noted above, the subchannel sampling rate changes depending on the main channel's sampling rate and the number of subchannels to be used. The figure below shows the difference in sampling rate when all subchannels (16 CH) are set to ON and when only two subchannels (subchannels 1 and 16) are set to ON.

Main channel's sampling rate: 200 kS/s

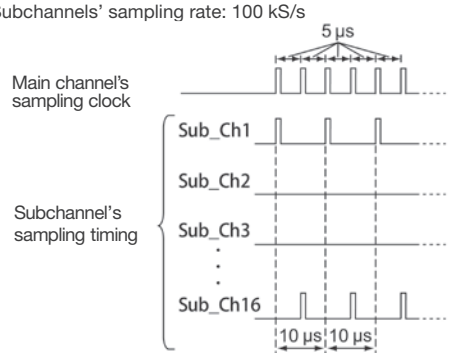
When the number of subchannels to be measured is 16 (all subchannels set to ON)

Subchannels' sampling rate: 10 kS/s



When the number of subchannels to be measured is 2 (subchannels 1 and 16 set to ON)

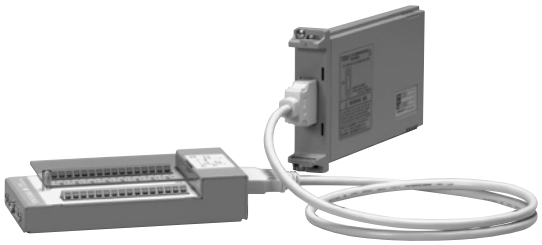
Subchannels' sampling rate: 100 kS/s



For example, if the main channel's sampling rate is 200 kS/s, the sampling clock is 5 µs period. The subchannels are sampled at this sampling clock in turn. Therefore, the subchannel's sampling timing is as shown in the figure above. Because scanning all required channel's takes time in proportion to the number of subchannels to be used (set to ON), the greater the number of subchannels to be used, the lower the sampling rate for one subchannel.
In the example shown above, the sampling rate is 10 kS/s (5 µs × 16 CH + 20 µs) when using 16 CH, while it is 100 kS/s (5 µs × 2) when using 2 CH.
The sampling rate that is displayed on the DL850E/DL850EV screen is the main channel's sampling rate.
The record length of each subchannel changes depending on the set record length and the number of subchannels to be used and there is a relationship between them as follows:

$$\text{Record length of each subchannel} \leq \frac{\text{set record length}}{\text{number of subchannels to be used}}$$

Using the 16-CH Temperature/Voltage Input Module (720221)



External Scanner Box (Model: 701953)

16-CH Temperature/Voltage Input Module (Model: 720221)

This is a multichannel input module capable of measuring up to 16 channels (subchannel's DC voltage or temperature measured by TC) on a single unit. It consists of the module body (model: 720221) and external scanner box (model: 701953) and both units are always required to make measurement. Wires for voltage measurement or a thermocouple for temperature measurement are connected to terminal blocks (screwed type) of the external scanner box.
The input section is isolated between ground and terminal blocks and between subchannels. For the voltage measurement range and temperature measurement range (available thermocouple types and accuracy), see the module specifications described on page 5 of this manual.
Both the maximum input voltage and the maximum allowable common mode voltage are 42 V (AC + DCpeak, 1 kHz or less).

Scanning method, Data updating period, and Bandwidth limit

Alternatives	Setting ①	Setting ②	Setting ③	Setting ④
Data updating period (selectable)	100 ms	300 ms	1 s	3 s
Bandwidth limit (–3 dB) (unselectable, automatic setting)	600 Hz	200 Hz	50 Hz	10 Hz

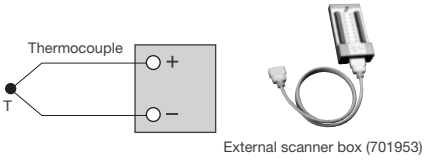
The data updating period can be selected from among the following settings ① to ④. According to the selected data updating period, the predetermined bandwidth limit is imposed as per the following combinations.

The scan data updating period for one scan (max. 16 CH) can be selected from among four types of alternatives (① to ④) shown in the table above. The selected updating period is independent of the number of subchannels to be used and is consistent. Thus, if setting ① is selected, a maximum of 16 points (CH) can be measured every 100 ms. The updating rate is also independent of the measurement object and is common to both voltage and temperature. The predetermined bandwidth limit is automatically enabled according to the selected scan data updating period. The combinations of the updating period and bandwidth limit are as shown in the table above (① to ④) .
If a signal to be measured contains significant noise, lower the data updating period. This allows the bandwidth limit to be enabled at a lower cut-off frequency, improving the noise reduction effect.

Reference junction compensation (RJC)

The RJC circuit is built into the external scanner box. The RJC allows switching between internal and external equipment. For details of the RJC compensation accuracy, see the module specifications described on page 4 of this manual.

Moreover, the external scanner box also incorporates a burnout circuit for detecting a wire break and this burnout detection is always available even during measurement. The burnout detection can be set to ON/OFF for each subchannel.



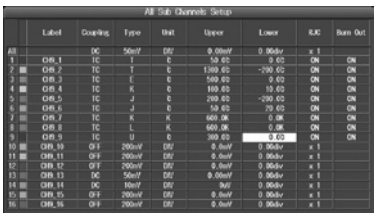
Reference junction compensation

Noise reduction performance

This module adopts the ΔΣ-type A/D conversion method. Using the digital filtering function based on oversampling, it reduces the noise effect and ensures accurate measurement.
The oversampling performs sampling (A/D conversion) at a higher frequency by comparison with input signal frequency. Since the module performs a larger number of samplings at a faster period to take the average of them, the resolution of measured values is improved, enabling a measured value closer to the true value to be obtained. At the same time, it provides a noise component reduction (averaging) effect if a signal contains noise. Moreover, because the sampling resolution is high, input signal waveforms can be reproduced more faithfully.

ΔΣ-type A/D conversion block diagram

In general temperature scanner modules, the filtering performance tends to be sacrificed (weakened) to improve the data updating period, and therefore high-frequency noise cannot be reduced sufficiently in some cases. The module also offers excellent common mode reduction performance as well as the ability to scan 16 points (CH) of data at an updating period as high as 100 ms.



Channel setting screen

Comparison with the 16-CH Voltage Input Module (720220)

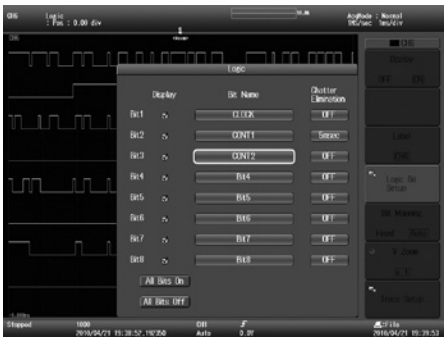
The features of the two types of 16-CH input modules (models: 720220 and 720221) are compared in the table below. The hatched areas show the features of the respective modules. You can select an appropriate module according to the measurement application.

	16-CH Voltage Module (720220)	16-CH Voltage/Temp. Module (720221)
Channels	16	16
Input	DC V	DC V, temperature
Voltage measurement range	200 mV/div to 2 V/div (1-2-5 steps)	1 mV/div to 2 V/div (1-2-5 steps)
Voltage accuracy	±(0.3% of 10 div)	±(0.15% of 10 div)
Updating period	5 µs max. (when only one subchannel is used)	100 ms, 300 ms, 1 s, or 3 s (user selectable) (Independent of the number of subchannels to be used)
Max. common mode voltage	42 V (DC + ACpeak) (CAT II, 30Vrms)	42 V (DC + ACpeak) (CAT II, 30Vrms)
Isolation between channels	No	Yes
A/D conversion resolution	16-bit (2400 LSB/div)	16-bit (2400 LSB/div)

Using the Logic Input Module (720230)

Logic Input Module (Model: 720230)

Input logic signals can be displayed as waveforms at a sampling resolution of up to 10 MS/s. Each port can measure 8 bits, and 2 ports of input are available on each module. Thus, a single module can observe 16-bit logic signals. You can turn the display



Logic display setting screen

of individual bits ON/OFF, and assign each bit its own unique label.
In all, you can input and display up to 128 bits of logic signals by installing up to eight modules in a single DL850E/DL850EV.

You can select from four different types of logic probe to best fit the input signal. (For details on logic probes, see page 7 of this catalog. Also see page 8 of this catalog for logic probes, adaptors, and other accessories.)
The input format, maximum input voltage, threshold level, and other settings depend on the logic probe being used; please refer to the specifications of your logic probe. The following logic probes can be used.

Logic probe
(TTL level/contact input)
1 m: 702911/3 m: 702912

High-speed logic probe
700986

Isolation logic probe
700987

Probe model	Number of inputs	Isolated/ non-isolated	Max. input voltage	Threshold level	Response time
702911/702912	8	Non-isolated	±35 V	Approx. 1.4 V	3 µs or less
700986	8	Non-isolated	30 Vrms	Approx. 1.4 V	1 µs or less
700987	8	Isolated	250 Vrms	6 VDC or 50 VAC	1 ms or less (DC), 20 ms or less (AC)

Input logic signals can also be displayed for numeric monitoring in either binary or hexadecimal format.
Moreover, you can put the cursor on the measured logic waveform to read bit data.

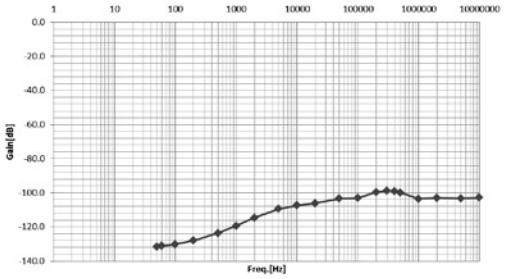
Using the 4-CH 1 MS/s 16-bit Isolation Module (720254)

4-CH 1 MS/s 16-bit Isolation Module (Model: 720254)

This module has 4-CH isolated BNC inputs. By installing 8 pieces of this module in a DL850E/EV, it makes total 32 channels stand-alone measurement system. This module meets your applications widely as isolated high-voltage and multi-channel (up to 32) measurements and recording.
The A/D conversion resolution is 16-bit (2400 LSB/div) and max. input voltage is 600 V (DC + ACpeak, when using 700929 or 701947 probe). Max. allowable common mode voltage is 300 Vrms (CAT Ⅱ).

The sample rate of this module will be always half of the 2-CH voltage input module such as 701250.

Another feature for this module is excellent noise immunity.
The common mode rejection ratio (CMRR) is more than 80 dB (50/60 Hz) (Typical).
The following graph shows typical data for the CMRR performance.



In general, a high number of isolated CHs and high resolution are required to record inverter signals typically 300 Vrms or greater for long periods of time. In transportation applications, a high number of isolated Chs are also essential to measure the advanced control signals and sensor output signals controlled by the ECU (Electronic Control Unit). An increase in the number of measurement systems in power plants also requires more channels in one instrument. troubleshooting can be done efficiently by measuring multiple signals simultaneously in one measuring instrument.
This module supports these applications.

CAN Bus
Monitor Module
(Model: 720240)

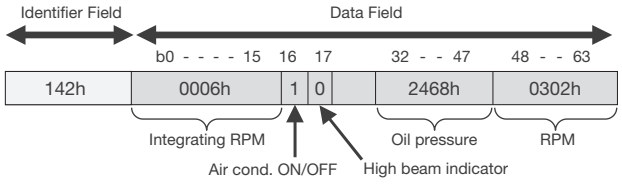
CAN & LIN Bus
Monitor Module
(Model: 720241)

SENT Monitor
Module
(Model: 720243)

These modules will interpret the vehicle installed communication protocols, monitor the communication data, and display the time series trend waveform. It is connected as a CAN or LIN bus node and can read data frames of each protocol communicating on the bus, or read transmitting signal values on SENT (Single Edge Nibble Transmission) from a sensor to a controller.
By combining them with other input modules, it can simultaneously measure communication data in a vehicle, voltage and temperature, sensor signals and other changes in analog data over time, as well as ECU (Electronic Control Unit) control logic signals. These data can be displayed as waveforms or saved as files. All related data in the system can be interpreted, thus enabling the evaluation of the overall vehicle installed system.
The CAN Bus Monitor Module (720240) is equipped with two CAN input ports, enabling a single module to be connected to two CAN network systems. The CAN & LIN Bus Monitor Module (720241) is equipped with one CAN and one LIN input port, enabling a single module to be connected to a CAN and a LIN protocol network. The SENT Monitor Module (720243) is equipped with two input ports, enabling max. 11 data trend are monitored simultaneously.

For the supported protocol of each modules, see the description of each specifications in this manual.

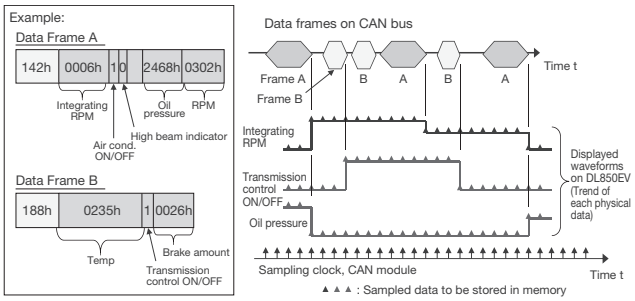
CAN data monitoring method (example)



Example of CAN frames and physical data

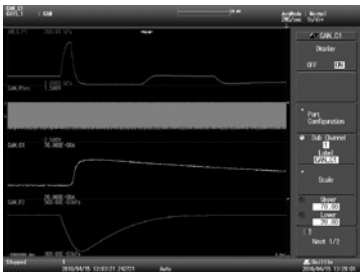
The following describes the CAN data monitoring method as an example.
With CAN data frames, multiple data (physical data) are carried and received under a single ID. These modules acquire (extract) identifiers for data fields defined as channel settings (for example, “oil pressure” or “RPM”), re-sample the data, and then convert it to time series data.
Data sections can be specified on up to 60 signals per port. That is, a total of up to 120 signals for a single CAN Bus Monitor Module (720240) and that of up to 60 signals for a single CAN & LIN Bus Monitor Module (720241). Both standard (11-bit) and extended (29-bit) message IDs can be specified, and arbitrary locations and bit lengths can also be specified for extraction.

The relationship between sampled data and displayed waveforms is as shown in the figure below (example of CAN).



Relationship between sampling data and displayed waveform (s), example

The following shows an example of the monitor screen.
Sampled data (trend waveform data) can be saved to files.
When monitoring LIN bus data using the CAN & LIN Bus Monitor Module (720241) or SENT using 720243 module, the same principle applies.



Example monitor screen

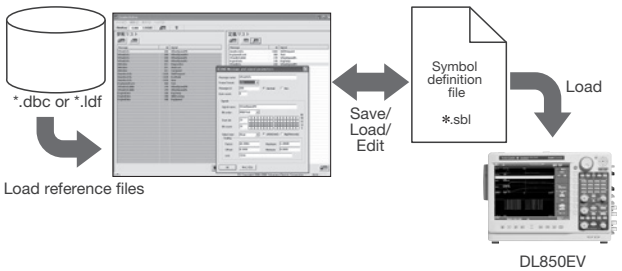
Using vehicle installed network definition files (CAN DBC, LIN LDF)

Data to be monitored (acquired) can not only be specified in digital codes (hexadecimal or numeric), but can also be loaded from each network definition file (CAN DBC or LIN LDF).

CAN DBC: Vector Informatik’s CANdb database file (.dbc format)

LIN LDF: LIN Description file, complying with the LIN Configuration Language Specification

Using Yokogawa’s free Windows PC software, “Symbol Editor”, you can convert these definition files to our proprietary symbol definition file (.sbl format) and import that file to the DL850EV.



Using a vehicle-installed network definition file

Outputting frame data (only CAN data)

At the CAN port, a single specified (defined) data frame or remote frame can be output (manually, at a desired timing).

Plug-in module model numbers

Model	Description
720211	High-speed 100 MS/s 12-Bit Isolation Module (2 ch)
701250	High-speed 10 MS/s 12-Bit Isolation Module (2 ch)
701251	High-speed 1 MS/s 16-Bit Isolation Module (2 ch)
720254	4-CH 1 MS/s 16-Bit Isolation Module
701255	High-speed 10 MS/s 12-Bit non-Isolation Module (2 ch)
701267	High-voltage 100 kS/s 16-Bit Isolation Module (with RMS, 2 ch)
720220	Voltage Input Module (16 ch)
701261	Universal Module (2 ch)
701262	Universal Module (with Anti-Aliasing Filter, 2 ch)
701265	Temperature/high-precision voltage Module (2 ch)
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, 2 ch)
701271	Strain Module (DSUB, Shunt-CAL, 2 ch)
701275	Acceleration/Voltage Module (with Anti-Aliasing Filter, 2 ch)
701281	Frequency Module (2 ch)
720230	Logic Input Module (16 ch)
720240	CAN Bus Monitor Module (32 ch, available DL850EV only)
720241	CAN & LIN Bus Monitor Module
720243	SENT Monitor Module

*Probes are not included with any modules.
*These modules can be used with the SL1000 as well with some exceptions.
*Up to four CAN Bus Monitor Modules (720240), CAN & LIN Bus Monitor Modules (720241) or SENT Monitor Module(720243) in total can be used on a single main unit. For the CAN Bus Monitor Modules (720240) and CAN & LIN Bus Monitor Modules (720241), up to two in total can be used on a single main unit. These modules are available for the DL850EV only.
*The use of a 720221 module always requires the External Scanner Box (model 701953).
*The firmware version 2.00 or later is required when using the 720221, 720241 modules.
*The firmware version 2.20 or later is required when using the 701267 module.
*The firmware version 3.10 or later is required when using the 701281 module.
*The firmware version 4.00 or later is required when using the 720211, 720243 and 720254 modules.

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 Friendy Product Design Guidelines and Product Design Assessment Criteria.

NOTICE

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

Probes, cables, and converters

Model	Product	Description*1
701947	100:1 Probe (for isolated BNC input)	1000 V (DC+ACpeak) CAT II
700929	10:1 Probe (for isolated BNC input)	1000 V (DC+ACpeak) CAT II
702902	10:1 Probe (for isolated BNC input)	operating temp. range: –40 to 85°C
701901	1:1 Safety BNC adapter lead (in combination with followings)	1000 Vrms-CAT II
701959	Safety mini-clip (Hook type)	1000 Vrms-CAT II, 1 set each of red and black
701954	Large alligator-clip (Dolphin type)	1000 Vrms-CAT II, 1 set each of red and black
758929	Alligator clip adaptor set (Rated voltage 1000 V)	1000 Vrms-CAT II, 1 set each of red and black
758922	Alligator clip adaptor set (Rated voltage 300 V)	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*2	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
701933	Current probe*3	30 Arms, DC to 50 MHz
701930	Current probe*3	150 Arms, DC to 10 MHz
701931	Current probe*3	500 Arms, DC to 2 MHz
701934	Probe power supply*4	Large current output, external probe power supply (4 outputs)
438920	Shunt resistor	250 Ω ±0.1%
438921	Shunt resistor	100 Ω ±0.1%
438922	Shunt resistor	10 Ω ±0.1%
700924	Differential probe	1400 Vpk, 1000 Vrms-CAT II
700925	Differential probe	500 Vpk, 350 Vrms (For 701255)
701926	Differential probe	7000 Vpk, 5000 Vrms
701955	Bridge head (NDIS, 120 Ω)	With 5 m cable
701956	Bridge head (NDIS, 350 Ω)	With 5 m cable
701957	Bridge head (DSUB, shunt-CAL, 120 Ω)	With 5 m cable
701958	Bridge head (DSUB, shunt-CAL, 350 Ω)	With 5 m cable
758924	Safety BNC-banana adapter	500 Vrms-CAT II
B9988AE	Printer roll paper	One lot : 10 rolls, 10m each
702911	Logic probe*5	8-Bit, 1 m, non-Isolated, TTL level/Contact Input
702912	Logic probe*5	8-Bit, 3 m, non-Isolated, TTL level/Contact Input
700986	High-speed logic probe*5	8-Bit, non-Isolated, response speed: 1 µs (typ.)
700987	Isolated logic probe*6	8-Bit, each channel isolated
758917	Measurement lead set	Measurement leads (2 per set) Alligator-Clip is required separately.
758933	Measurement lead set	1000 V/19 A/1 m length Alligator-Clip is required separately.
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)
720911	External I/O cable	For external I/O connection
701948	Plug-on clip	For 700929 and 701947
701906	Long test clip	For 700924, 701901 and 701926
A1800JD	Terminal	For 720220 input terminal, one (1) piece
701963	Soft carrying case	For DL850E/DL850EV
705926	Connecting cables	Connecting cable for 701953 (1 m)
705927	Connecting cables	Connecting cable for 701953 (3 m)
701971	DC power supply cable (Alligator clip type)	For DL850EV DC 12 V Power
701970	DC power supply cable (Cigarette lighter plug type)	For DL850EV DC 12 V Power
B8023WZ	dc power supply connector	It comes standard with the /DC option
A1058ER	GPS antenna (3 m)	It comes standard with the /C30 option

*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: Any number of externally powered probes can be used.
*5: Includes one each of the B9879PX and B9879KX connection leads.
*6: Additionally, 758917 and either the 758922 or 758929 are required for measurement.

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

YMI-KS-MI-SE01

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