

Product Datasheet - Technical Specifications



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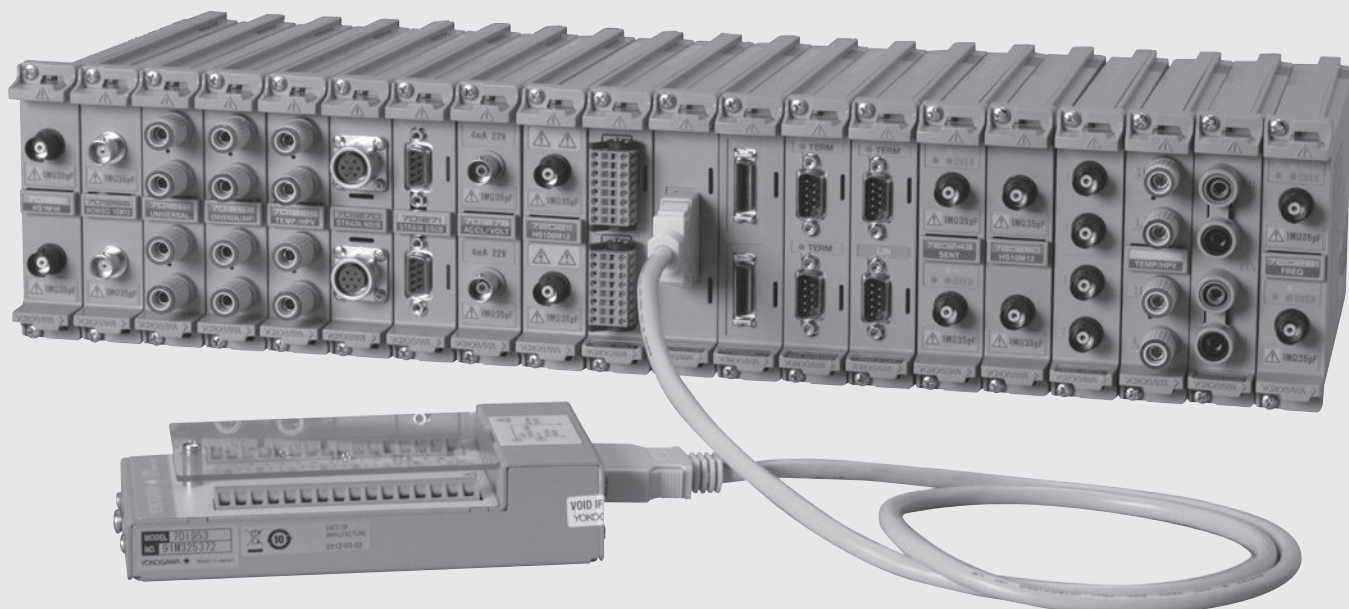
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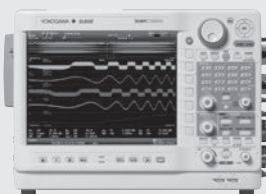
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Plug-in modules specifications

ScopeCorder series
DL850E/DL850EV/DL350/SL1000



Module Selection

| Input | Model No. | Sample rate | Resolution | Bandwidth | Number of channels | Isolation | Maximum measurement voltage ¹⁾ (DC+ACpeak) | DC accuracy | Note |
|------------------------------|---------------------|---|---------------------------------------|--|-----------------------|--|--|---------------------------------------|--|
| Analog Voltage | 720211 ⁸ | 100 MS/s | 12 bit | 20 MHz | 2 | Isolated | 1000 V ² , 200 V ³ | ±0.5% | High speed · High voltage · Isolated |
| | 720250 | 10 MS/s | 12 bit | 3 MHz | 2 | Isolated | 800 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 input/low noise, high noise immunity |
| | 701255 | 10 MS/s | 12 bit | 3 MHz | 2 | Non-Isolated | 600 V ² , 200 V ³ | ±0.5% | High speed · Non isolated |
| | 720268 | 1 MS/s | 16 bit | 300 kHz | 2 | Isolated | 1000 V ^{2,11} | ±0.25% | With AAF, RMS, and high noise immunity |
| | 720220 | 200 kS/s | 16 bit | 5 kHz | 16 | Isolated (GND-terminal) non-isolated (CH-CH) | 20 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, KP/AuFe) |
| | 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, KP/AuFe), 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, KP/AuFe), 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, KP/AuFe), high sensitivity range (0.1 mV/div), Low noise |
| Strain | 720221 ⁷ | 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, KP/AuFe) |
| | 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 |
| Analog Voltage, Acceleration | 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 |
| | 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 ² , 42 V ³ | ±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 | 720242 | 100 kS/s | — | — | (60 signals × 2) port | Isolated | 10 V | — | CAN/CAN FD port × 2, CAN/CAN FD Data of maximum 32 bit allowable ^{5,6} |
| CAN, LIN | 720241 | 100 kS/s | — | — | (60 signals × 2) port | Isolated | 10 V (CAN port) 18 V (LIN port) | — | CAN port × 1 (CAN FD is not supported), LIN port × 1 ^{5,6} |
| SENT | 720243 | 100 kS/s | — | — | 11 data × 2 ports | Isolated | 42 V | — | Supported protocol: SAE J2716, ^{5,6} |

*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: Any other modules can be installed in the remaining slots. *6: When using these modules with DL850EV, up to four CAN Bus Monitor Modules (720240), CAN & LIN Bus Monitor Modules (720241), CAN/CAN FD monitor modules (720242) 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), CAN/CAN FD monitor modules (720242), up to two in total can be used on a single main unit. *7: The 16 CH Scanner Box (701953) is required for measurement. *8: Class 1 Laser Product, IEC/EN60825-1:2007, GB7247.1-2012 *9: In combination with 758933 and 701954. *10: See the main specifications for voltage-axis sensitivity setting and measurement range. *11: 1000 Vrms (1000 VDC or 1414 Vpeak maximum) when using with DL350. 850V (DC + ACpeak) when using with DL850/DL850V/DL850E/DL850EV or SL1000

Refer to the following table to confirm the compatibility of plug-in modules with main units.

Compatibility of the plug-in modules with the main units

| Model | Plug-in Module Name | Remark | Main Unit | | | |
|--------|---|--------------------|-----------|--------|---------|--------|
| | | | DL350 | DL850E | DL850EV | SL1000 |
| 720210 | High-speed 100 MS/s 12 Bit Isolation Module | Discontinued | No | Yes | Yes | Yes |
| 720211 | High-speed 100 MS/s 12 Bit Isolation Module | | Yes | Yes | Yes | Yes |
| 701250 | High-speed 10 MS/s 12 Bit Isolation Module | Discontinued | No | Yes | Yes | Yes |
| 720250 | High-speed 10 MS/s 12 Bit Isolation Module | | Yes | Yes | Yes | Yes |
| 701251 | High-speed 1 MS/s 16 Bit Isolation Module | | No | Yes | Yes | Yes |
| 720254 | 4 CH 1 MS/s 16 Bit Isolation Module | | Yes | Yes | Yes | No |
| 701255 | High-speed 10 MS/s 12 Bit non-Isolation Module | | No | Yes | Yes | Yes |
| 701267 | High-voltage 100 kS/s 16 Bit Isolation Module (with RMS) | Discontinued | No | Yes | Yes | Yes |
| 720268 | High-voltage 1 MS/s 16 Bit Isolation Module (with AAF, RMS) | | Yes | Yes | Yes | Yes |
| 720220 | 16 CH Voltage Input Module | | Yes | Yes | Yes | No |
| 701261 | Universal Module | | Yes | Yes | Yes | Yes |
| 701262 | Universal Module (with AAF) | | Yes | Yes | Yes | Yes |
| 701265 | Temperature/High-Precision Voltage Module | | Yes | Yes | Yes | Yes |
| 720266 | Temperature/High-Precision Voltage Isolation Module (Low Noise) | | Yes | Yes | Yes | Yes |
| 720221 | 16 CH Temperature/Voltage Input Module | | Yes | Yes | Yes | No |
| 701270 | Strain Module (NDIS) | | Yes | Yes | Yes | Yes |
| 701271 | Strain Module (DSUB, Shunt-CAL) | | Yes | Yes | Yes | Yes |
| 701275 | Acceleration/Voltage Module (with AAF) | | Yes | Yes | Yes | Yes |
| 701281 | Frequency Module | Discontinued | No | Yes | Yes | Yes |
| 720281 | Frequency Module | | Yes | Yes | Yes | Yes |
| 720230 | Logic Input Module | | Yes | Yes | Yes | No |
| 720240 | CAN Bus Monitor Module | To Be Discontinued | Yes | No | Yes | No |
| 720242 | CAN/CAN FD Monitor Module | | Yes | No | Yes | No |
| 720241 | CAN & LIN Bus Monitor Module | | Yes | No | Yes | No |
| 720243 | SENT Monitor Module | | Yes | No | Yes | No |

* Probes are not included with any modules.

* The use of a 720221 module always requires the External Scanner Box (model 701953).

* Firmware update may be required depending the module used.

* /VE option is required when using 720240, 720241, 720242 or 720243 module with DL350.

* Refer to the note described in page 18 when using 720254 module with DL850E and DL850EV.

* 720240 CAN Bus Monitor Module will be discontinued in September 2018.

Main Specifications (plug-in modules)

*1: Under standard operating conditions (temperature of 23°C ±5°C, 20 to 80% RH, warm-up of 30 minutes 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 7 for notes on the maximum input voltage and maximum rated voltage to earth.

*12: See the figure on page 7 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 |
| Input connector | BNC connector (isolated type) |
| Input impedance | 1 MΩ ±1%, approx. 35 pF |
| Maximum sample rate | 100 MS/s |
| Frequency range (-3 dB) ^{*1} | DC to 20 MHz |
| A/D conversion resolution | 12 bit (150 LSB/div) |
| Voltage-axis sensitivity setting ^{*12} | 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 rated voltage to earth (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) |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| Temperature coefficient | Zero point: ±(0.1% of 10 div)/°C (Typ.) Gain: ±(0.05% of 10 div)/°C (Typ.) |
| Bandwidth limit | Full/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. 290 g |

| High-Speed 10 MS/s, 12 Bit Isolation Module (720250) | |
|--|--|
| 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 |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| 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} | Direct input: 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} | 800 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) (Maximum allowable voltage, as a value that does not damage the instrument when applied.) |
| Direct input ^{*10} | 42 V (DC + ACpeak) |
| Maximum rated voltage to earth (1 kHz or less) | |
| In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1) ^{*3} | 400 Vrms (CAT II) |
| In combination with 701901 + 701954 (1:1) ^{*9} | 400 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 | Full/500 Hz/5 kHz/50 kHz/500 kHz |
| Weight | Approx. 280 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 |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| 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} | Direct input: 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 rated voltage to earth (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)/°C (Typ.) 2 mV/div: ±(0.05% of 10 div)/°C (Typ.) 1 mV/div: ±(0.10% of 10 div)/°C (Typ.) Gain 1 mV/div to 20 V/div: ±(0.02% of 10 div)/°C (Typ.) |
| Bandwidth limit | Full/400 Hz/4 kHz/40 kHz |
| Weight | Approx. 270 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 |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| 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} | Direct input: 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) (Maximum allowable voltage, as a value that does not damage the instrument when applied.) |
| Direct input ^{*10} | 42 V (DC + ACpeak) |
| Maximum rated voltage to earth (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 coefficient | Zero point: ±(0.02% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |
| Bandwidth limit | Full/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. 310 g |

| | |
|---|--|
| Frequency range (-3 dB) ^{*1} | DC to 300 kHz |
| A/D conversion resolution | 12 bit (150 LSB/div) |
| Voltage-axis sensitivity setting ^{*12} | Direct input: 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) (Maximum 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)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |

| 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} | Direct input: 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) (Maximum 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)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |

| | |
|---|--|
| Frequency range (-3 dB) ^{*1} | DC to 300 kHz |
| A/D conversion resolution | 12 bit (150 LSB/div) |
| Voltage-axis sensitivity setting ^{*12} | Direct input: 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) (Maximum 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)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |

| | |
|-----------------|----------------------------------|
| Bandwidth limit | Full/500 Hz/5 kHz/50 kHz/500 kHz |
| Weight | Approx. 270 g |

High-Voltage 1 MS/s, 16 Bit Isolation Module (with AAF, RMS) (720268)

| | |
|--|--|
| 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 | 2 MΩ ±1%, Approx. 12 pF |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| Maximum sample rate | 1 MS/s |
| Frequency range (-3 dB) ¹ | Waveform observation mode DC to 300 kHz RMS observation mode DC, 40 Hz to 100 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 or 701904) + 701954 (1:1) ⁹ 1000 Vrms (1000 VDC or 1414 Vpeak maximum) ¹³ |
| Direct input ¹⁰ | 42 V (DC + ACpeak) |
| Maximum rated voltage to earth (1 kHz or less) | In combination with (758933 or 701904) + 701954 (1:1) ⁹ 1000 Vrms (CAT II), 600 Vrms (CAT III) |
| Direct input | 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 10 kHz Crest factor 2 or less: ±(2.0% of 10 div) At frequency of 40 Hz to 10 kHz Crest factor 3 or less: ±(3.0% of 10 div) At frequency of 40 Hz to 10 kHz 1 kHz to 10 kHz: Add 1.0% on the above AC accuracy. |
|-------------|--|

| | |
|---|--|
| Temperature coefficient (Waveform observation mode) | Zero point: ±(0.02% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |
|---|--|

| | |
|-----------------|------------------------------|
| Bandwidth limit | Full/400 Hz/4 kHz/40 kHz/AAF |
|-----------------|------------------------------|

| | |
|--------------------------------------|---|
| Response time (RMS observation mode) | Rising (0 to 90% of 10 div) 120 ms (Typ.) Falling (100 to 10% of 10 div) 280 ms (Typ.) |
|--------------------------------------|---|

| | |
|--------|---------------|
| Weight | Approx. 280 g |
|--------|---------------|

¹³: 850 V (DC + ACpeak) when using with DL850/DL850V/DL850E/DL850EV or SL1000

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 |
| A/D conversion resolution | 16 bit (2400 LSB/div) |
| 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 rated voltage to earth (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.) |
| Temperature coefficient | Zero point: ±(0.02% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |
| Bandwidth limit | Full/500 Hz (Selectable for each sub-CH) |
| Weight | Approx. 230 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 |
| A/D conversion resolution | Voltage: 16 bit (2400 LSB/div) Temperature: 0.1°C |

| | |
|---|-------------------------------------|
| -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 | -200°C to 1300°C | ±(0.1% of reading + 1.5°C) Except ±(0.2% of reading + 1.5°C) for -200°C to 0°C |
| E | -200°C to 800°C | |
| J | -200°C to 1100°C | |
| T | -200°C to 400°C | |
| L | -200°C to 900°C | |
| U | -200°C to 400°C | |
| N | 0°C to 1300°C | |
| R | 0°C to 1700°C | ±(0.1% of reading + 3°C) Except, 0 to 200°C: ±8°C 200°C to 800°C: ±5°C |
| S | | |
| B | 0°C to 1800°C | ±(0.1% of reading + 2°C) Except, 400°C to 700°C: ±8°C Effective range is 400°C to 1800°C |
| W | 0°C to 2300°C | ±(0.1% of reading + 3°C) |
| KP/AuFe | 0 K to 300 K | 0 K to 50 K: ±4 K 50 K to 300 K: ±2.5 K |

Thermocouple standard JIS C1602 (K, E, J, T, N, R, S, B)

| | |
|---------------------------------------|--|
| 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 rated voltage to earth (1 kHz or less) | 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
|--|--------------------------------------|

| | |
|-----------------------------------|--|
| Temperature coefficient (Voltage) | Zero point: ±(0.01% of 10 div)/°C (Typ.) Gain: ±(0.02% of 10 div)/°C (Typ.) |
|-----------------------------------|--|

| | |
|---|---|
| Reference junction comp. accuracy (at input terminal temp. balancing) | K, E, J, T, L, U, N: ±1°C R, S, B, W: ±1.5°C KP/AuFe: ±1 K |
|---|---|

| | |
|-----------------|--|
| Bandwidth limit | Voltage: Full/AUTO (AAF)/40 Hz/400 Hz/4 kHz Temperature: Full/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. 280 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 |
| A/D conversion resolution | Voltage: 16 bit (2400 LSB/div) Temperature: 0.1°C |

| | |
|---|-------------------------------------|
| -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 | -200°C to 1300°C | ±(0.1% of reading + 1.5°C) Except ±(0.2% of reading + 1.5°C) for -200°C to 0°C |
| E | -200°C to 800°C | |
| J | -200°C to 1100°C | |
| T | -200°C to 400°C | |
| L | -200°C to 900°C | |
| U | -200°C to 400°C | |
| N | 0°C to 1300°C | |
| R | 0°C to 1700°C | ±(0.1% of reading + 3°C) Except, 0 to 200°C: ±8°C 200°C to 800°C: ±5°C |
| S | | |
| B | 0°C to 1800°C | ±(0.1% of reading + 2°C) Except, 400°C to 700°C: ±8°C Effective range is 400°C to 1800°C |
| W | 0°C to 2300°C | ±(0.1% of reading + 3°C) |
| KP/AuFe | 0 K to 300 K | 0 K to 50 K: ±4 K, 50 K to 300 K: ±2.5 K |

Thermocouple standard JIS C1602 (K, E, J, T, N, R, S, B)

| | |
|---------------------------------------|--------------------|
| Maximum input voltage (1 kHz or less) | 42 V (DC + ACpeak) |
|---------------------------------------|--------------------|

| | |
|--|--------------------------------------|
| Maximum rated voltage to earth (1 kHz or less) | 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
|--|--------------------------------------|

| | |
|--|--|
| Temperature coefficient (Voltage) | Zero point: $\pm(0.01\%$ of 10 div/ $^{\circ}\text{C}$ + 0.05 $\mu\text{V}/^{\circ}\text{C}$ (Typ.) Gain: $\pm(0.02\%$ of 10 div/ $^{\circ}\text{C}$ (Typ.) |
| Reference junction comp. accuracy (at input terminal temp. balancing) | K, E, J, T, L, U, N: $\pm 1^{\circ}\text{C}$ R, S, B, W: $\pm 1.5^{\circ}\text{C}$ KP/AuFe: $\pm 1\text{ K}$ |
| Bandwidth limit | Full/2 Hz/8 Hz/30 Hz |
| Weight | Approx. 270 g |

Temperature/High-Precision Voltage Isolation Module (Low noise) (720266)

| | |
|--|---|
| 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 M Ω |
| Data update rate | 125 Hz |
| Frequency range (-3 dB)¹ | DC to 15 Hz |
| A/D conversion resolution | Voltage: 16 bit (2400 LSB/div) Temperature: 0.1 $^{\circ}\text{C}$ |
| -3 dB point when AC coupled low frequency attenuation point | Voltage measurement: 0.5 Hz or less |
| Measurement range/accuracy¹ | Voltage measurement: Voltage-axis sensitivity setting ¹² 100 $\mu\text{V}/\text{div}$ to 10 V/div (1-2-5 steps) Vertical (voltage) axis accuracy $\pm(0.08\%$ of 10 div + 2 μV) |

Temperature measurement

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

| Type | Measurement Range | Accuracy |
|---------|--|---|
| K | -200 $^{\circ}\text{C}$ to 1300 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 1.5 $^{\circ}\text{C}$) Except $\pm(0.2\%$ of reading + 1.5 $^{\circ}\text{C}$) for -200 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$ |
| E | -200 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$ | |
| J | -200 $^{\circ}\text{C}$ to 1100 $^{\circ}\text{C}$ | |
| T | -200 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | |
| L | -200 $^{\circ}\text{C}$ to 900 $^{\circ}\text{C}$ | |
| U | -200 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | |
| N | 0 $^{\circ}\text{C}$ to 1300 $^{\circ}\text{C}$ | |
| R | 0 $^{\circ}\text{C}$ to 1700 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 3 $^{\circ}\text{C}$) Except, 0 to 200 $^{\circ}\text{C}$: $\pm 8^{\circ}\text{C}$ 200 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$: $\pm 5^{\circ}\text{C}$ |
| S | | |
| B | 0 $^{\circ}\text{C}$ to 1800 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 2 $^{\circ}\text{C}$) Except, 400 $^{\circ}\text{C}$ to 700 $^{\circ}\text{C}$: $\pm 8^{\circ}\text{C}$ Effective range is 400 $^{\circ}\text{C}$ to 1800 $^{\circ}\text{C}$ |
| W | 0 $^{\circ}\text{C}$ to 2300 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 3 $^{\circ}\text{C}$) |
| KP/AuFe | 0 K to 300 K | 0 K to 50 K: $\pm 4\text{ K}$, 50 K to 300 K: $\pm 2.5\text{ K}$ |

Thermocouple standard JIS C1602 (K, E, J, T, N, R, S, B)

Maximum input voltage (1 kHz or less)

42 V (DC + ACpeak)

Maximum rated voltage to earth (1 kHz or less)

42 V (DC + ACpeak) (CAT II, 30 Vrms)

Temperature coefficient (Voltage) Zero point: $\pm(0.01\%$ of 10 div/ $^{\circ}\text{C}$ + 0.05 $\mu\text{V}/^{\circ}\text{C}$ (Typ.)
Gain: $\pm(0.02\%$ of 10 div/ $^{\circ}\text{C}$ (Typ.)

Reference junction comp. accuracy (at input terminal temp. balancing)
K, E, J, T, L, U, N: $\pm 1^{\circ}\text{C}$ R, S, B, W: $\pm 1.5^{\circ}\text{C}$
KP/AuFe: $\pm 1\text{ K}$

Bandwidth limit Full/0.1 Hz/1 Hz/8 Hz

Weight Approx. 270 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 $\pm(0.15\%$ of 10 div) |

Temperature measurement

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

| Type | Measurement Range | Accuracy |
|---------|--|---|
| K | -200 $^{\circ}\text{C}$ to 1300 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 1.5 $^{\circ}\text{C}$) Except $\pm(0.2\%$ of reading + 1.5 $^{\circ}\text{C}$) for -200 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$ |
| E | -200 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$ | |
| J | -200 $^{\circ}\text{C}$ to 1100 $^{\circ}\text{C}$ | |
| T | -200 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | |
| L | -200 $^{\circ}\text{C}$ to 900 $^{\circ}\text{C}$ | |
| U | -200 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | |
| N | 0 $^{\circ}\text{C}$ to 1300 $^{\circ}\text{C}$ | |
| R | 0 $^{\circ}\text{C}$ to 1700 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 3 $^{\circ}\text{C}$) Except, 0 to 200 $^{\circ}\text{C}$: $\pm 8^{\circ}\text{C}$ 200 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$: $\pm 5^{\circ}\text{C}$ |
| S | | |
| B | 0 $^{\circ}\text{C}$ to 1800 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 2 $^{\circ}\text{C}$) Except, 400 $^{\circ}\text{C}$ to 700 $^{\circ}\text{C}$: $\pm 8^{\circ}\text{C}$ Effective range is 400 $^{\circ}\text{C}$ to 1800 $^{\circ}\text{C}$ |
| W | 0 $^{\circ}\text{C}$ to 2300 $^{\circ}\text{C}$ | $\pm(0.1\%$ of reading + 3 $^{\circ}\text{C}$) |
| KP/AuFe | 0 K to 300 K | 0 K to 50 K: $\pm 4\text{ K}$, 50 K to 300 K: $\pm 2.5\text{ K}$ |

Thermocouple standard JIS C1602 (K, E, J, T, N, R, S, B)

| | |
|--|--|
| Maximum input voltage (1 kHz or less) | Both voltage & temp. 42 V (DC + ACpeak) |
| Maximum rated voltage to earth (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 $^{\circ}\text{C}$ |
| 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 bit (2400 LSB/range) |
| Temperature coefficient | Zero point: $\pm(0.025\%$ of 10 div/ $^{\circ}\text{C}$ (Typ.) Gain: $\pm(0.01\%$ of 10 div/ $^{\circ}\text{C}$ (Typ.) |
| Reference junction comp. accuracy (at input terminal temp. balancing) | K, E, J, T, L, U, N: $\pm 1^{\circ}\text{C}$ R, S, B, W: $\pm 1.5^{\circ}\text{C}$ KP/AuFe: $\pm 1\text{ K}$ |
| 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 M Ω |
| 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. 220 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 \times (μSTR range/1000) | | | | | | | | | | | | | | |
| Measurement range/measurable range | <table border="1"> <thead> <tr> <th>Measurement range (FS)</th> <th>Measurable range (-FS to +FS)</th> </tr> </thead> <tbody> <tr> <td>500 μSTR</td> <td>-500 μSTR to +500 μSTR</td> </tr> <tr> <td>1000 μSTR</td> <td>-1000 μSTR to +1000 μSTR</td> </tr> <tr> <td>2000 μSTR</td> <td>-2000 μSTR to +2000 μSTR</td> </tr> <tr> <td>5000 μSTR</td> <td>-5000 μSTR to +5000 μSTR</td> </tr> <tr> <td>10000 μSTR</td> <td>-10000 μSTR to +10000 μSTR</td> </tr> <tr> <td>20000 μSTR</td> <td>-20000 μSTR to +20000 μSTR</td> </tr> </tbody> </table> | 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 |
| 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 rated voltage to earth (1 kHz or less)

42 V (DC + ACpeak) (CAT II, 30 Vrms)

DC accuracy¹ $\pm(0.5\%$ of FS + 5 μSTR)

Temperature coefficient Zero point: ± 5 $\mu\text{STR}/^{\circ}\text{C}$ (Typ.)
Gain: $\pm(0.02\%$ of FS) $^{\circ}\text{C}$ (Typ.)

Bandwidth limit Full/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. 260 g

| Acceleration/Voltage Module (with AAF) (701275) | |
|--|--|
| Input channels | 2 |
| Input type | Isolated unbalanced |
| Input coupling | AC, DC, ACCL (acceleration), and GND |
| Input connector | BNC connector (metallic type) |
| Input impedance | 1 MΩ ±1%, approx. 35 pF |
| Common mode rejection ratio | 80 dB (50/60 Hz) or more (Typ.) |
| 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 rated voltage to earth (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 | Full/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. 280 g |

| Frequency Module (702081) | |
|--------------------------------|--|
| Measurement function | Frequency (Hz), RPMs, RPSs, period (s), duty cycle (%), power supply frequency (Hz), pulse width (s), 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 rated voltage to earth | In combination with 700929 (10:1)/702902 (10:1)/701947 (100:1) ³ 400 Vrms (CAT II) Direct input ¹¹ 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
| Bandwidth limit | Full/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 (s) | 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 (s) | 1 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. 270 g

| Logic Input Module (702030) | |
|-----------------------------|--|
| 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/CAN FD Monitor Module (702042) | |
|------------------------------------|--|
| 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, 200 k, 250 k, 400 k, 500 k, 800 k, 1 Mbps |
| Flexible data rate | 1 M, 2 M, 3 M, 4 M, 5 Mbps |
| Supported protocol | CAN, CAN FD (ISO 11898-1: 2015 or non-ISO) Physical layer: ISO-11898 (High Speed Communication) |
| Terminator | Built-in, it is switchable On and Off per port. |
| Endian | Little or Big selectable |
| LED display | Indicates on/off status of built-in terminator in each port |
| Channel setting | Message ID (Standard or Extended) Extraction Position Bit Length (Maximum 32 bit) Select the Endian (little or big) Convert physical value |

| | |
|---|---|
| Output function | Single shot Specified ID (Data) can be outputted manually. (Up to 64 bytes of CAN FD data frame is supported.) |
| Allowable voltage range | -3 V to +10 V (CAN_H,CAN_L input to GND) |
| Maximum rated voltage to earth (1 kHz or less) | 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
| Weight | Approx. 240 g |

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 32 bits |
| | Input channels 60-signal/port |
| | Supported data field checksum Standard and extended checksums |
| CAN port specifications | Maximum input voltage -3 V to +10 V (CAN_H,CAN_L input to GND) Maximum allowable common mode voltage 30 Vrms (CAT II) Input connector D-sub 9-pin (male) Terminator Built-in, it is switchable On and Off Endian Little or Big selectable LED display Indicates on/off status of built-in terminator Supported protocol Physical layer: ISO-11898 (High Speed Communication) Bit rate 10 k, 20 k, 33.3 k, 50 k, 62.5 k, 66.7 k, 83.3 k, 100 k, 125 k, 200 k, 250 k, 400 k, 500 k, 800 k, 1 Mbps Supported data length 32 bits Input channels 60-signal/port Output function Single shot Specified ID (Data) can be outputted manually. |

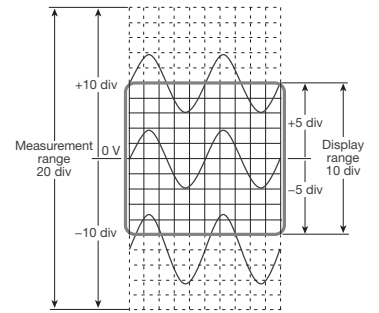
Weight Approx. 240 g

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 8 CH maximum SLOW CHANNEL 5 CH maximum (Up to 8 CH in total by FAST CHANNEL and SLOW CHANNEL) STATUS & COMMUNICATION 1 CH (4 bit) Error 1 CH Error count 1 CH |
| FAST CHANNEL analysis | FAST CHANNEL MULTIPLEXING support |
| 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 rated voltage to earth | 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
| Weight | Approx. 260 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.

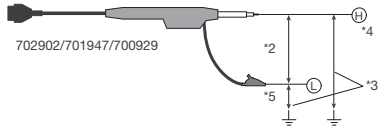


- Move the vertical position.
- Set the offset voltage.
- Zoom in or out of the vertical axis (expand/reduce).

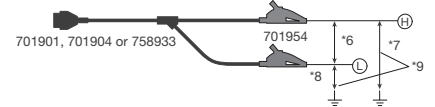
Maximum Input Voltage and Maximum rated voltage to earth

See Specifications of Plug-in Modules

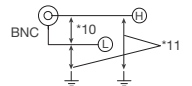
In combination with 702902/701947/700929



In combination with (701901+701954), (701904+701954) or (758933+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, Maximum rated voltage to earth. 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) | |
|---|---|
| Frequency range (-3 dB) | DC to 200 MHz |
| Attenuation ratio | 100:1 |
| Input impedance/capacitance | 100 MΩ ±1% ¹ / 7 pF |
| 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 |
| Total length | 1.5 m |

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 Passive Probe (Wide operating temperature range) (702902) | |
|--|---|
| Frequency range (-3 dB) | DC to 60 MHz |
| Attenuation ratio [*] | 10:1 (Fixed) ±2% (5 to 40°C) ±3% (-40 to 5°C, 40 to 85°C) |
| 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 |
| Total length | 2.5 m |
| Operating temperature range | -40 to +85°C |

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

| 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. |
| Total length | 1.5 m |

| Current Probe (701917) | |
|--------------------------------|--|
| Frequency range (-3 dB) | DC to 50 MHz |
| Maximum continuous input range | 5 Arms (The maximum allowable input decreases depending on the frequency.) |
| Maximum peak current | 7.5 Apeak, non-continuous |
| Output voltage rate | 1 V/A |
| Amplitude accuracy | ±1% of reading ±1 mV typical, ±3.0% of reading ±1 mV (DC, and 45 to 66 Hz) |

| Current Probe (701918) | |
|--------------------------------|--|
| Frequency range (-3 dB) | DC to 120 MHz |
| Maximum continuous input range | 5 Arms (The maximum allowable input decreases depending on the frequency.) |
| Maximum peak current | 7.5 Apeak, non-continuous |
| Output voltage rate | 1 V/A |
| Amplitude accuracy | ±1% of reading ±1 mV typical, ±3.0% of reading ±1 mV (DC, and 45 to 66 Hz) |

| Current Probe (701932) | |
|--------------------------------|---|
| Frequency range (-3 dB) | DC to 100 MHz |
| Maximum continuous input range | 30 Arms (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% of reading ±1 mV 30 Arms to 50 Apeak: ±2% of reading (DC, and 45 to 66 Hz) |

| 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% of reading ±1 mV 30 Arms to 50 Apeak: ±2% of reading (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% of reading ±1 mV 150 A to 300 A: ±2% of reading (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% of reading ±5 mV 500 A to 700 A: ±2% of reading (DC, and 45 to 66 Hz) |

| Clamp-on Probe (720930) | |
|----------------------------|--|
| Measuring range | AC 0 to 50 Arms |
| Measurable conductor size | Maximum 18 mm diameter |
| Output voltage | AC 0 to 500 mVrms (10 mV/A) |
| Accuracy (sine wave input) | Bandwidth ±0.5% of reading ±0.1 mV (50/60 Hz) ±0.8% of reading ±0.2 mV (40 Hz to 1 kHz) ±1.0% of reading ±0.4 mV (1 kHz to 3.5 kHz) Phase Within ±2.0 deg (0.5 to 50 A, 40 Hz to 3.5 kHz) |
| Maximum allowable input | AC 130 Arms continuous (50/60 Hz) |
| Output impedance | Approx. 18 Ω |
| Output terminal | BNC connector (isolated) |
| External dimensions | 52 (W) × 106 (H) × 25 (D) mm (excluding protrusions) |
| Cable length | Approx. 3 m |
| Weight | Approx. 210 g |

| Clamp-on Probe (720931) | |
|----------------------------|--|
| Measuring range | AC 0 to 200 Arms (300 Apeak) |
| Measurable conductor size | Maximum 30 mm diameter |
| Output voltage | AC 0 to 500 mVrms (2.5 mV/A) |
| Accuracy (sine wave input) | Bandwidth ±0.5% of reading ±0.1 mV (50/60 Hz) ±0.8% of reading ±0.2 mV (40 Hz to 1 kHz) ±1.0% of reading ±0.4 mV (1 kHz to 3.5 kHz) Phase Within ±1.0 deg (2 to 200 A, 40 Hz to 3.5 kHz) |
| Maximum allowable input | AC 250 Arms continuous (50/60 Hz) |
| Output impedance | Approx. 6 Ω |
| Output terminal | BNC connector (isolated) |
| External dimensions | 73 (W) × 130 (H) × 30 (D) mm (excluding protrusions) |
| Cable length | Approx. 3 m |
| Weight | Approx. 280 g |

| 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 |

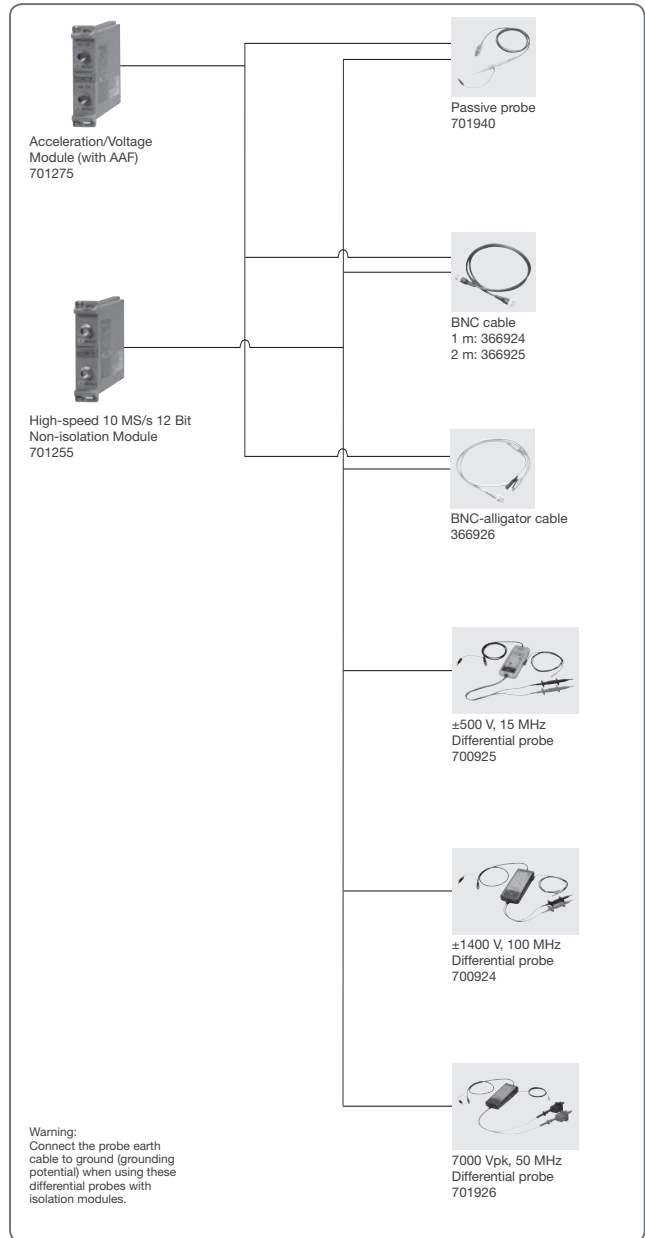
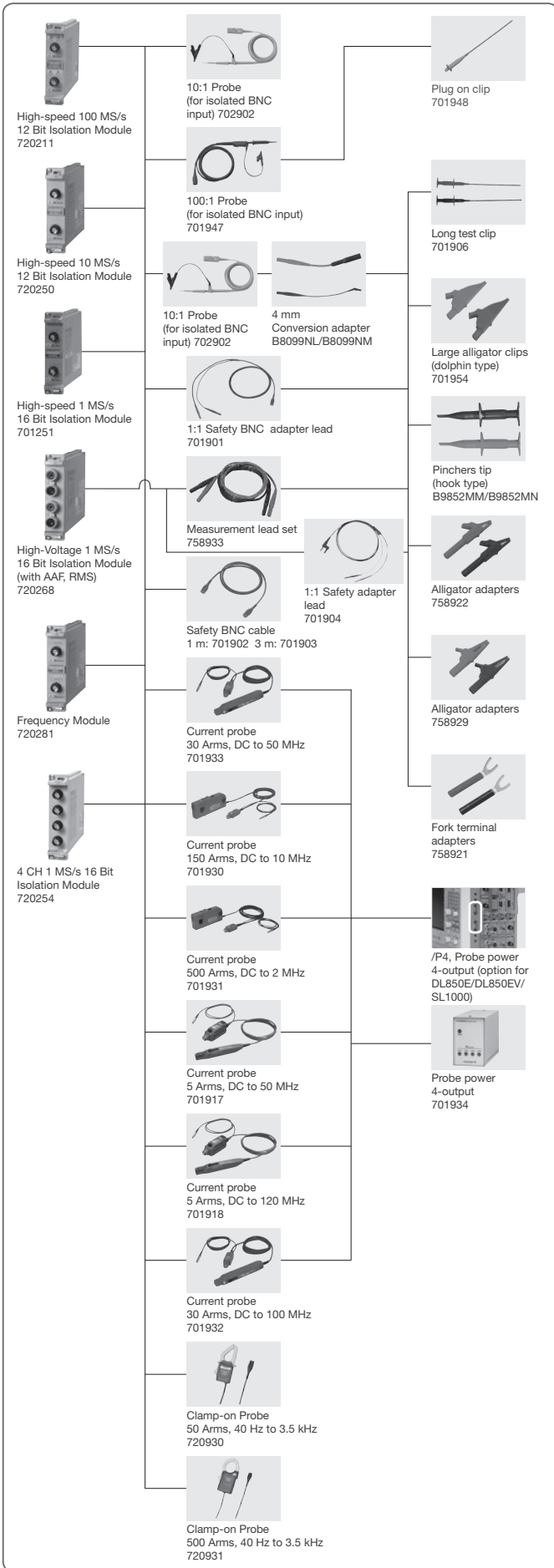
^{*}Derating is applied towards frequencies.

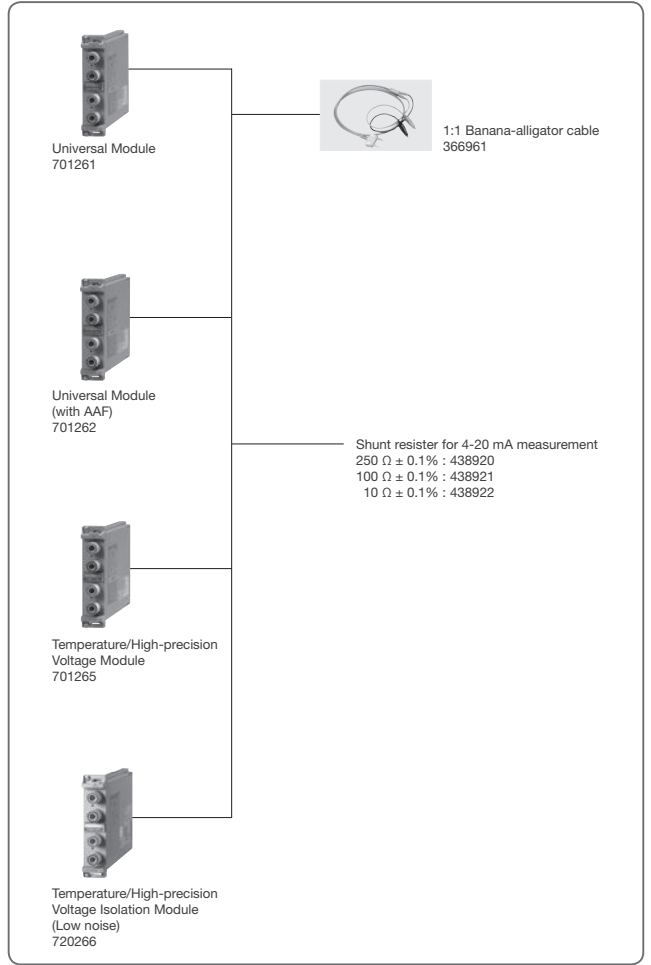
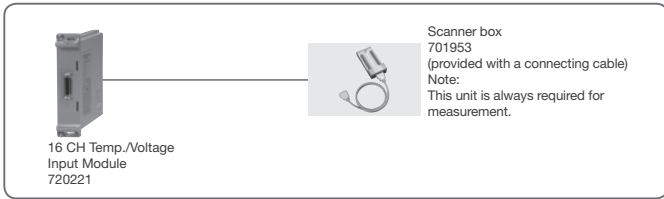
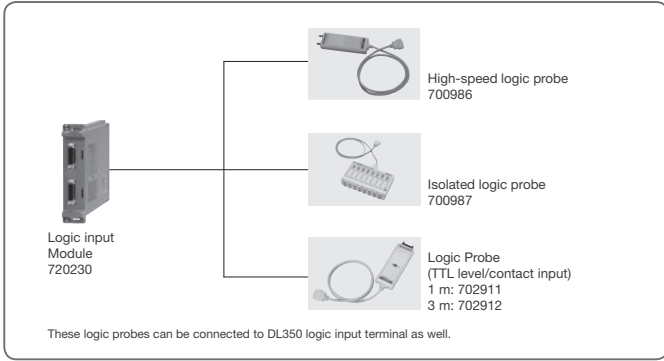
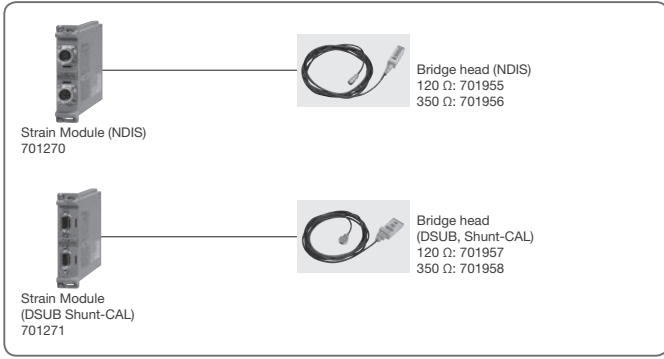
| High Voltage Differential Probe (701926) | |
|--|---|
| Frequency range (-3 dB) | DC to 50 MHz |
| Attenuation | 1000:1 or 100:1, switchable |
| Input resistance and capacitance (Typ.) | 50 MΩ + approx. 17 pF (parallel with respect to ground) |
| Allowable differential voltage (between + and - terminals) | 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°C, 25 to 85%RH (no condensation) |
| Power requirements | <ul style="list-style-type: none"> 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 M Ω /approx. 22 pF (10:1), 200 pF maximum (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 | \pm 35 V |
| Response time | 3 μ s (Typ.) |
| Input impedance | 10 k Ω 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 μ s (Typ.) |
| Input impedance | Approx. 100 k Ω |
| 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) \times 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 \pm 50% AC input 50 VAC \pm 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 rated voltage to earth (1 kHz or less) | 250 Vrms (CAT II) |
| Maximum allowable voltage between bits | 250 Vrms (CAT II) |
| Input impedance | Approx. 100 k Ω |
| 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 $^{\circ}$ C Humidity: 20 to 85% RH |
| External dimensions | 701955, 701956: Approx. 37 (W) \times 97 (H) \times 30 (D) mm 701957, 701958: Approx. 50 (W) \times 101 (H) \times 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, 701917, 701918 Differential probe: 701920, 701921, 701922, 700924, 701926 |
| No. of Power Receptacles | 4 |
| Output Voltage | \pm (12 \pm 0.5) V |
| Rated Output Current | \pm 2.5 A (total value for each output) |
| Rated Supply Voltage | 100 to 240 VAC (actual power supply voltage may fluctuate within \pm 10% of the rating) |
| Ripple Voltage | 50 mVp-p |
| Rated Power | 190 VA maximum (at the rated output current) |
| External Dimensions | 80 (W) \times 119 (H) \times 200 (D) mm |
| Weight | Approx. 1.2 kg |

Module and accessory combinations





Using the Strain Modules (701270, 701271)



Strain Module (NDIS)
(Model: 701270)

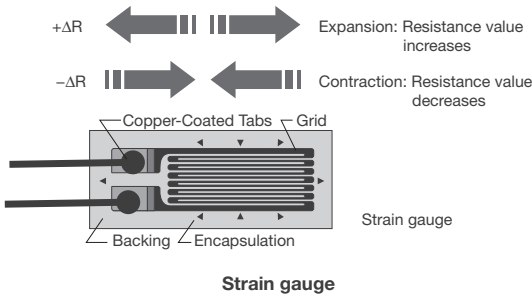


Strain Module (DSUB, Shunt-CAL)
(Model: 701271)

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.

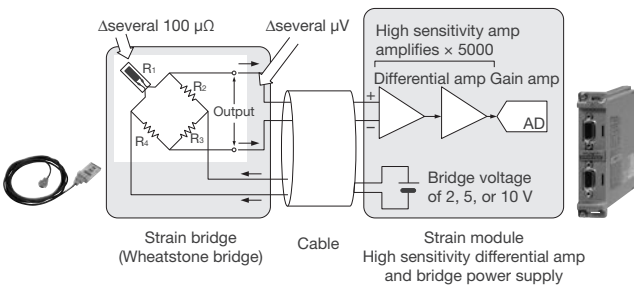
Strain gauge

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.



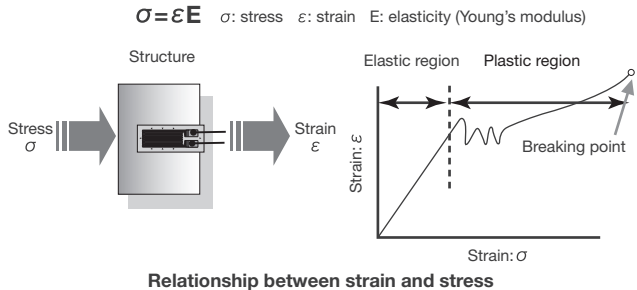
Strain gauge and measurement circuit

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.

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

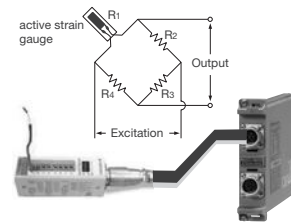
You can determine structural durability (elasticity) by measuring the strain.



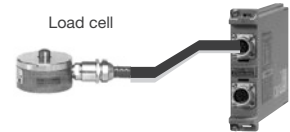
Stress is calculated using the relationship of elasticity (Young's modulus), which depends on structure's material, and the durability of the structure.

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



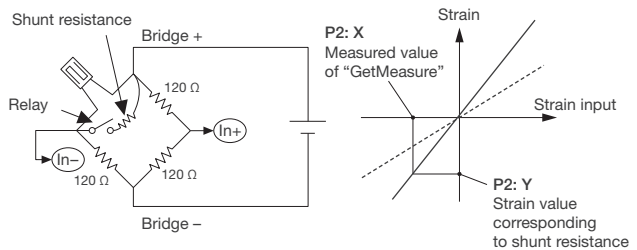
For strain measurements with a strain gauge, use the accessory bridge head.



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)

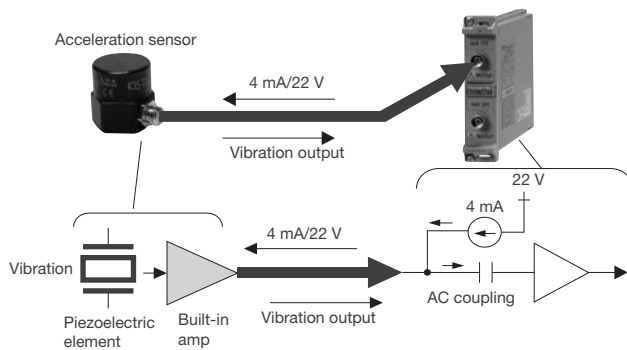
This module will accept direct input from a built-in amp type acceleration sensor to measure acceleration. You can also connect a charge output type acceleration sensor via a commercially available charge converter. Additionally, the module doubles as a voltage module to support common voltage measurements, 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.

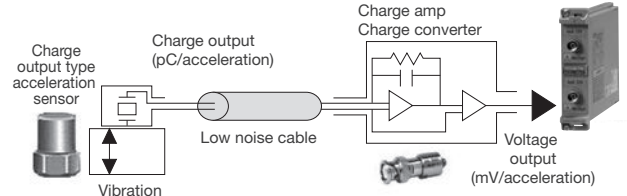


Connecting a built-in amp type acceleration sensor

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 PCB: ICP Endevco: isotron2

Charge output type acceleration sensors

When you need to perform measurements by connecting a charge output type acceleration sensor, you can input to the 701275 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 or charge output type acceleration sensor via charge converter, turn ON the bias output (constant drive current).

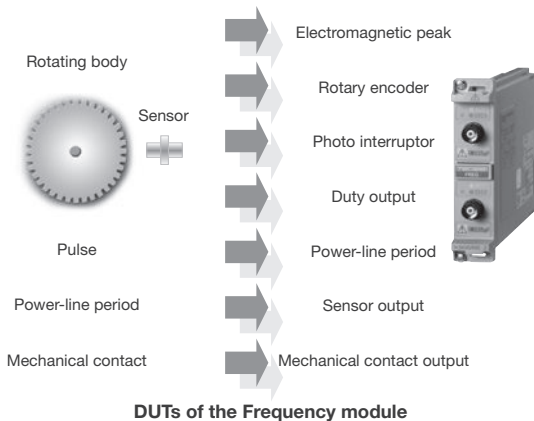
Using the Frequency Module (720281)



Frequency Module (Model: 720281)

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

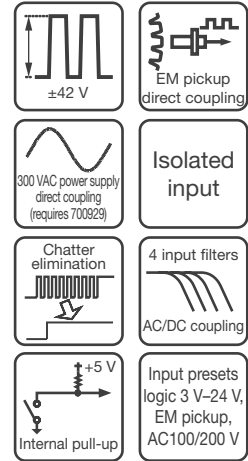
| Test item | Real-time calculation | Measurement range ¹ | Measurement |
|---|--|--|-------------|
| Frequency (Hz) | $\text{Frequency (Hz)} = \frac{1}{T_w \text{ (s)}}$ | 0.01 Hz to 500 KHz | |
| Period (s) | $\text{Period (s)} = T_w \text{ (s)}$ | 2 μs to 50 s | |
| Rpm | $\text{Rpm} = \frac{\text{freq. (Hz)}}{\text{pulses per revolution (Nr)}} \times 60$ | 0.01 rpm to 100000 rpm | |
| Rps | $\text{Rps} = \frac{\text{freq (Hz)}}{\text{pulses per revolution (Nr)}}$ | 0.001 rps to 2000 rps | |
| Duty (%) | $\text{Duty (\%)} = \frac{T_{\text{high}} \text{ (s)}}{T_w \text{ (s)}} \text{ or } \frac{T_{\text{low}} \text{ (s)}}{T_w \text{ (s)}}$ | 0% to 100% | |
| Pulse width | $\text{Pulse width (s)} = T_{\text{high}} \text{ (s)} \text{ or } T_{\text{low}} \text{ (s)}$ | 1 μs to 50 s | |
| Power Supply Freq. (Hz) | $\text{Power supply freq. (Hz)} = \frac{1}{T_w \text{ (s)}}$ at the 50/60 Hz setting, 0.01 Hz resolution | (50 Hz, 60 Hz, 400 Hz) ±20 Hz | |
| Pulse Integration (Distance/Quantity of flow) | $\text{Distance} = N \text{ (count)} \times \text{distance per pulse } \ell$ *Distance ℓ and units are user-definable. | up to 2 × 10 ⁹ count | |
| Velocity (km/h, mph) | $\text{Velocity (km/h)} = \frac{\text{distance per pulse } \ell \text{ (km)}}{T_w \text{ (s)}} \times 3600$ $\text{Velocity (m/s)} = \frac{\text{distance per pulse } \ell \text{ (m)}}{T_w \text{ (s)}}$ *Units are user-definable (angular velocity and other units) | $F = \left(\frac{1}{T_w}\right)$ = 0.01 Hz to 200 kHz | |

¹ Allowable input frequency range: 0.01 Hz to 200 kHz

Unlike general FV converters, the model 720281 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

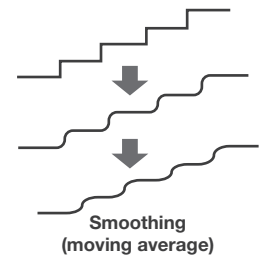
A variety of signal types can be input, such as encoder pulse input of up to ±42 V, powered electromagnetic pickup direct input (1:1), and AC power of up to 300 V (when using a 10:1 probe). The isolation function, amplifier, and filters are all equivalent to those in a normal voltage module, therefore 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

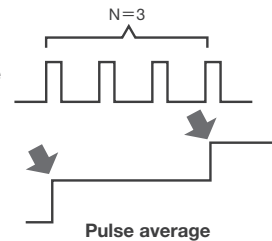
Smoothing filter (Moving average)

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 s (up to the 25000th order). Filters reduce jitter in observed waveforms, and increases resolution.



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).

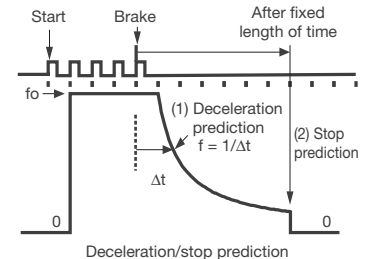


Supports braking applications

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.

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.

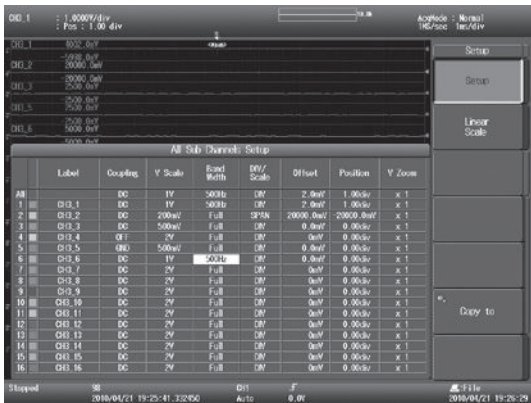
The maximum sampling rates are 200 kS/s (for 1 CH) and 10 kS/s (for 16 CH simultaneously). The minimum voltage input range is 200 mV/div, and the maximum input voltage is 42 V (direct input, 1 kHz or less).

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.



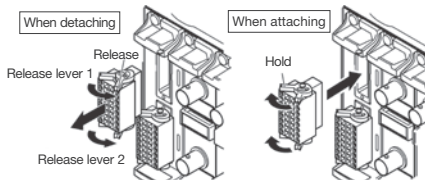
Channel setting screen (DL850E)

Connecting wires to terminal block

The following electrical wire is recommended. 0.20 mm² to 1.00 mm² (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.



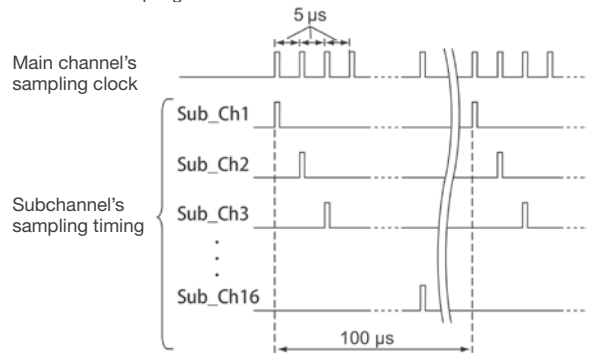
Number of subchannels to be used, sampling rate, and record length

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

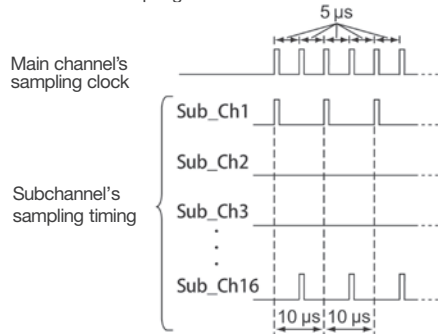
When the number of subchannels to be measured is 16 (all subchannels set to ON)

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.

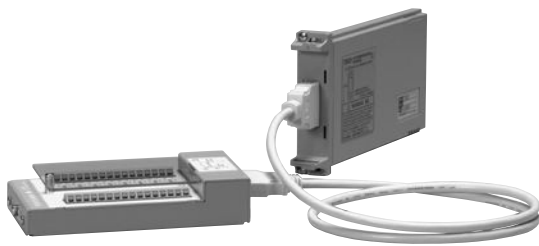
In the example shown above, the sampling rate is 10 kS/s (5 μs × 16 CH + 20 μs) when using 16 CH, while it is 100 kS/s (5 μs × 2) when using 2 CH.

The sampling rate that is displayed on the main unit 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 maximum rated voltage to earth 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 |

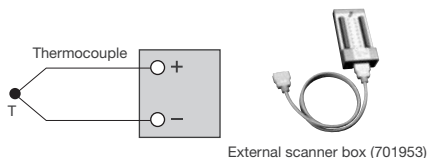
The data updating period can be selected from among the following settings ① to ④. According to the selected data updating period, the predetermined bandwidth limit is imposed as per the following combinations.

The scan data updating period for one scan (maximum 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 5 of this bulletin.

Moreover, the external scanner box also incorporates



Reference junction compensation

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.

Noise reduction performance

This module adopts the $\Delta\Sigma$ -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.



$\Delta\Sigma$ -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.

| Label | Grouping | Type | Unit | Upper | Lower | RJC | Burn Out |
|-------|----------|---------|------|--------|---------|-----|----------|
| CH 1 | DC | 50mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 2 | TC | T | C | 100.00 | -200.00 | ON | ON |
| CH 3 | TC | F | C | 100.00 | -200.00 | ON | ON |
| CH 4 | TC | E | C | 100.00 | -200.00 | ON | ON |
| CH 5 | TC | J | C | 100.00 | -200.00 | ON | ON |
| CH 6 | TC | K | C | 100.00 | -200.00 | ON | ON |
| CH 7 | TC | L | C | 100.00 | -200.00 | ON | ON |
| CH 8 | TC | Ni | C | 100.00 | -200.00 | ON | ON |
| CH 9 | DC | 200mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 10 | DC | 500mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 11 | DC | 1000mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 12 | DC | 2000mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 13 | DC | 5000mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 14 | DC | 10000mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 15 | DC | 20000mV | 0V | 0.000V | 0.999V | x 1 | ON |
| CH 16 | DC | 50000mV | 0V | 0.000V | 0.999V | x 1 | ON |

Channel setting screen (DL850E)

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 μ s maximum (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) |
| Maximum rated voltage to earth | 42 V (DC + ACpeak) (CAT II, 30 Vrms) | 42 V (DC + ACpeak) (CAT II, 30 Vrms) |
| 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)

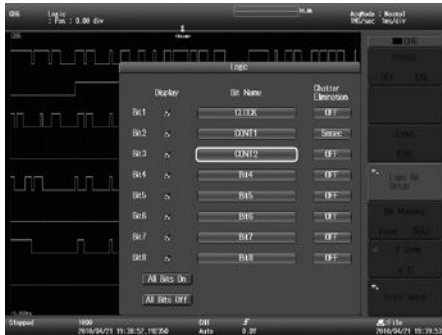
| Probe model | Number of inputs | Isolated/non-isolated | Maximum input voltage | Threshold level | Response time |
|---------------|------------------|-----------------------|-----------------------|-----------------|--|
| 702911/702912 | 8 | Non-isolated | ±35 V | Approx. 1.4 V | 3 μs or less |
| 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.

17

Input logic signals can be displayed as waveforms at a sampling resolution of up to 10 MS/s. Each port can measure 8 bit, 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 (DL850E)

of individual bits ON/OFF, and assign each bit its own unique label.

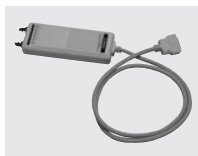
In all, you can input and display up to 128 bit of logic signals by installing up to eight modules in a single DL850E/DL850EV for example.

You can select from four different types of logic probe to best fit the input signal. (For details on logic probes, see page 9 of this bulletin.)

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

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



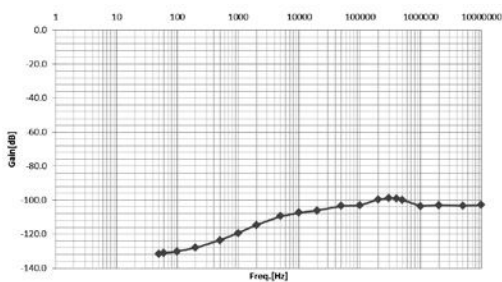
4 CH 1 MS/s 16 Bit Isolation Module (Model: 720254)

This module has 4 CH isolated BNC inputs. By installing 8 pieces of this module in a DL850E/EV for example, 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 maximum input voltage is 600 V (DC + ACpeak, when using 700929 or 701947 probe). Maximum rated voltage to earth is 300 Vrms (CAT II).

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.

Note

When using this module with the DL850E/DL850EV, the sample rate will be always half or less of the 2 CH voltage input module such as 720250 under the same recording length.

When an external clock signal is applied, the sample rate will also be always half or less of the sample rate of the external clock. Please pay particular attention when using only the 4 CH 1 MS/s, 16 bit isolation module(s) sampled by an external pulse signal such as a rotary encoder.

The sample timing is simultaneous for 4 CH. Refer to the following table for detail.

Relationship between the main channel sample rate and the 4 CH 1 MS/s, 16 bit isolation module sample rate. (DL850E/DL850EV only)

| Main channel sample rate (S/s) | Sample rate of the 4 CH 1 MS/s, 16 bit isolation module (720254) (S/s) |
|--------------------------------|--|
| 100 M | 1 M |
| 50 M | 1 M |
| 20 M | 1 M |
| 10 M | 1 M |
| 5 M | 1 M |
| 2 M | 1 M |
| 1 M | 500 k |
| 500 k | 100 k |
| 200 k | 100 k |
| 100 k | 50 k |
| 50 k | 10 k |
| 20 k | 10 k |
| 10 k | 5 k |
| 5 k | 1 k |
| 2 k | 1 k |
| 1 k | 500 |
| 500 | 100 |
| 200 | 100 |
| 100 | 50 |
| 50 | 10 |
| 20 | 10 |
| 10 | 5 |
| 5 | 1 |

Using the CAN/CAN FD Monitor Module (720242), the CAN & LIN Bus Monitor Module (720241) and the SENT Monitor Module (720243)



CAN/CAN FD Monitor Module (Model: 720242)
 CAN & LIN Bus Monitor Module (Model: 720241)
 SENT Monitor Module (Model: 720243)

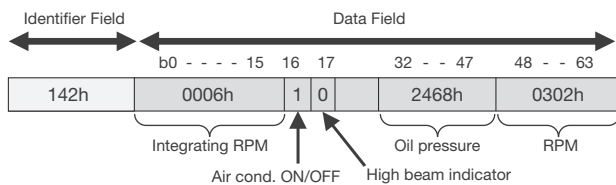
These modules will interpret the vehicle installed communication protocols, monitor the communication data, and display the time series trend waveform. It is connected as a CAN/CAN FD or LIN bus node and can read data frames of each protocol communicating on the bus, or read transmitting signal values 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/CAN FD Monitor Module (720242) is equipped with two CAN/CAN FD input ports, enabling a single module to be connected to two CAN/CAN FD 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. This module does not support CAN FD. The SENT Monitor Module (720243) is equipped with two input ports, enabling maximum 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

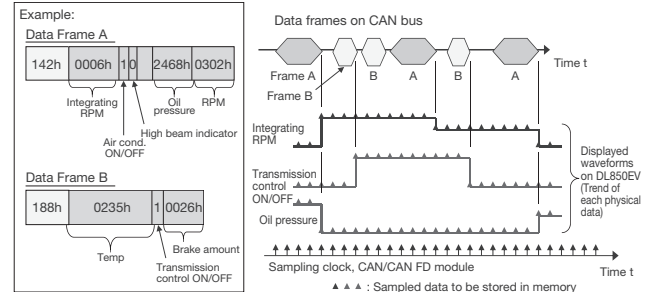
The following describes the CAN data monitoring method as an example.

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/CAN FD Monitor Module (720242) 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 (up to 32 bits) can also be specified for extraction.

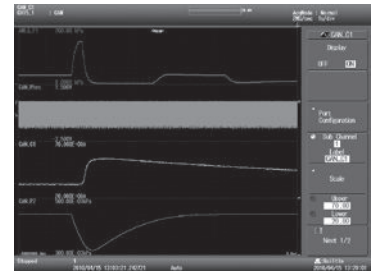
The relationship between sampled data and displayed waveforms is as shown in the figure below (example of CAN).



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 (DL850EV)

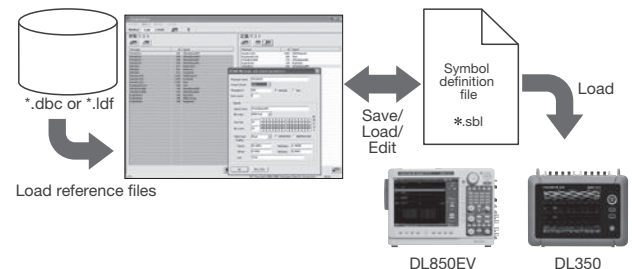
Using vehicle installed network definition files (CAN DBC, LIN LDF)

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 main unit.



Using a vehicle-installed network definition file

Outputting frame data (only CAN/CAN FD data)

At the CAN/CAN FD port on 720242 and CAN port on 720241, 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 |
| 720250 | High-speed 10 MS/s 12 Bit Isolation Module |
| 701251 | High-speed 1 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 |
| 720242 | CAN/CAN FD Monitor Module |
| 720241 | CAN & LIN Bus Monitor Module |
| 720243 | SENT Monitor Module |

- * Probes are not included with any modules.
- * The use of a 720221 module always requires the External Scanner Box (model 701953).
- * Firmware update may be required when using these modules.
- * Specifications may be changed depending on the main unit.

The High-Speed 100 MS/s, 12-Bit Isolation Module (model: 720211) uses an Internal laser light source.



Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007
2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan

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- 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.

Probes, cables and converters*8

| Model | Product | Description ¹ |
|----------------------------------|---|--|
| 701947 | 100:1 Probe (for isolated BNC input) | 1000 V (DC+ACpeak) CAT II, 1.5 m |
| 702902 | 10:1 Probe (for isolated BNC input) | operating temp. range: -40 to 85°C, 2.5 m |
| 700929 | 10:1 Probe (for isolated BNC input) | 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 | 1000 Vrms CAT II, 600 Vrms CAT III |
| (in combination with followings) | | |
| B9852MM | Pinchers tip (Hook type) | 1000 Vrms CAT III black |
| B9852MN | Pinchers tip (Hook type) | 1000 Vrms CAT III red |
| 701954 | Large alligator-clip (Dolphin type) | 1000 Vrms CAT III, 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 |
| 701917 | Current probe ^{3,4} | 5 Arms, DC to 50 MHz |
| 701918 | Current probe ^{3,4} | 5 Arms, DC to 120 MHz |
| 701932 | Current probe ^{3,4} | 30 Arms, DC to 100 MHz |
| 701933 | Current probe ^{3,4} | 30 Arms, DC to 50 MHz |
| 701930 | Current probe ^{3,4} | 150 Arms, DC to 10 MHz |
| 701931 | Current probe ^{3,4} | 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 |
| 701934 | Probe power supply | 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, 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 |
| B9988AE | Printer roll paper | One lot : 10 rolls, 10m each, for DL850E/EV |
| 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 | Isolation logic probe ⁶ | 8 bit, each channel isolated |
| 758917 | Measurement lead set | 0.75 m, Stackable type (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) |
| 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 |
| 705926 | Connecting cables | Connecting cable for 701953 (1 m) |
| 705927 | Connecting cables | Connecting cable for 701953 (3 m) |

*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: Either the probe power option of the main unit or the probe power supply (701934) is required.

*4: The number of current probes that can be powered from the main unit's probe power option is limited.

*5: Includes one each of the B9879PX and B9879KX connection leads.

*6: Additionally, 758917 and either the 758922 or 758929 are required for measurement.

*7: Alligator clip is required.

*8: Refer to the bulletin, user's manual of each products to confirm compatibility of each accessory and 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.

YOKOGAWA

YOKOGAWA TEST & MEASUREMENT CORPORATION

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